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the state of the library art

edited by Ralph R. Shaw

volume 3, part 1

Buildings

by

Ralph E. Ellsworth

volume 3, part 2

Shelving

by

Louis Kaplan

volume 3, part 3

Storage Warehouses

by

Jerrold Orne

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Preface

Pierce Butler planted the seed of this work some thirty years ago when he attempted to persuade me to follow my translation of Georg Schneider's "Theory and History of Bibliography" with an English rendering of Milkau's "Handbuch der Bibliothekswissenschaft." As we discussed this in his cubbyhole at the University of Chicago it became increasingly apparent that for all the excellence and usefulness of the Milkau, a version in English would require such wide revision and additions as to constitute a completely new work, and the project was, I thought, abandoned. Over the years, however, it remained a subject of, perhaps sometimes sub-conscious, dreaming, thinking, and occasionally some work.

When the Council on Library Resources was organized its need for information on the state of the library art resulted in almost spontaneous germination of Pierce Butler's long dormant seed. This resulted in a grant to the Graduate School of Library Service at Rutgers for preparation, under the direction of the undersigned, of a review of the status of our current knowledge of librarianship. From the inception of this project it was recognized that the initial grant could cover only somewhat less than half of the vast field, and there are many areas of librarianship still to be covered.

An advisory committee helped in the design of the program and in determining priorities for treatment of the various aspects of the field.

The advisory committee included: Dr. Julian H. Bigelow, Institute for Advanced Study at Princeton, New Jersey, Mr. Verner W. Clapp, President of the Council on Library Resources, Mr. Donald Coney, Librarian of

the University of California, Mr. J. W. Kuipers, Apparatus research and development in Itek Corporation, Dr. Robert D. Leigh, Dean of the School of Library Service at Columbia University, Dr. Lowell A. Martin, Dean of the Graduate School of Library Service at Rutgers, Professor A. J. Riker of the College of Agriculture at the University of Wisconsin, Dr. Melville J. Ruggles, Vice-president of the Council on Library Resources, Mr. A. N. Sears, Vice-president of Remington Rand, and Dr. Eugene H. Wilson, Vice-president of the University of Colorado.

Since the volumes now completed and being prepared for publication cover perhaps forty percent of the entire range of librarianship and bibliography, the plan of publication is in the familiar "Handbuch" form so as to permit the addition of volumes as financial resources and dedicated writers become available.

The organization of the series in various stages of production is tentatively as follows:

Volume One -- Technical Service
- Part 1. Cataloging, by Maurice F. Tauber.
- Part 2. Subject Heading, by Carlyle J. Frarey.
- Part 3. Classification, by Maurice F. Tauber and Edith Wise, Coding, by Doralyn Hickey.
- Part 4. Acquisition, Gifts and Exchanges, by Helen J. Harrar and Ronald Watterson, Donald E. Thompson and others.

Volume Two -- Reader Services
- Part 1. Training laymen in use of the library by George S. Bonn
- Part 2. Bibliographical services, by Margaret S. Bryant.
- Part 3. Charging systems, by Lila H. Kirkwood.

Volume Three -- Storage of Library Materials
- Part 1. Buildings, by Ralph E. Ellsworth.
- Part 2. Shelving, by Louis Kaplan.
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Volume Five -- Reproduction of Materials

Part 1. Production of microforms, Reginald Hawkins.

Part 2. Reading Devices, by Jean Stewart.

Part 3. Production of full-size copies, by William Hawken.

It is hoped that all of the above will be in print before the end of 1960. In preparing these for publication it appeared best to permit some variations in style from one volume to another rather than to devote a large percentage of our resources to achieving a standard style for all.

The general pattern followed in these studies consists of a survey of the published and unpublished literature of each facet of the field. In this survey, as a first step, each compiler attempts to summarize what the literature says with a minimum of redundancy but without editorial comment. Each statement is accompanied by a footnote so that investigation in depth can be conducted when necessary, but for most purposes, if we have adequately performed our primary task, it should be unnecessary to search the literature for information on the topics covered. A second step, provided to support each allegation or statement in the literature and an indication of whether that particular bit of "the art" is empirical or the extent and reliability of the objective data provided to support it.

This pattern of presentation is modified in a number of the parts of the series since, except for the sake of external uniformity, it would serve little purpose to repeat substantially every statement in this second part followed by the words, "no objective evidence."

It was initially planned to present each summary in the historical perspective of the development of its field but this method of treatment was found unsuitable for some of the subjects. In some cases, such as the study of "Reading Devices for Micro-Images," both historical and topical treatments are presented; in others the treatment is historical only, and in still others primary emphasis is given to topical treatment. Here as in the review of evidence, suitability for each topic is given priority over external uniformity of the set.

While a few of these reports were prepared by staff assistants, as indicated by the list of titles and research staff given above, we were fortunate in enlisting participants of outstanding authority and reputation in most of the subject areas treated. In most cases the resultant first draft was read by one or more additional specialists in the field and in this work we had the assistance of such well known authorities as: Hubbard W. Ballou, Ralph H. Carruthers, Ralph Esterquest, Robert A. Fairthorne, John Fall, Charles F. Gosnell, Lutz Helbig, Laurence Kipp, Alfred H. Lane, Chester Lewis, Calvin N. Mooers, Robert H. Muller, Maurice F. Tauber, Lawrence S. Thompson, and others.

This is the concerted work of many hands, and many more than those listed above have helped in almost countless ways. Such value as may reside in this series is the result of professional contributions of high order by many people. Final responsibility for the plan of work, selection and supervision of research staff, revision of manuscripts as well as editing them and production of the volumes rested solely on the undersigned and he accepts full responsibility for the imperfections to be found in this series. It is hoped that this review of the library art will, on balance, be found to make a useful contribution and that it may some time be carried forward to cover the whole field of librarianship.

Ralph R. Shaw

Volume Three Part One

LIBRARY BUILDINGS

by

Ralph E. Ellsworth

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Introduction

The problem of housing research library collections and of providing suitable space for readers did not become acute until the last half of the 19th Century, when, as a result of the rotary press, library collections became sizeable. (1, 2, 3) Prior to this time, wall shelving in a large room in a nobleman's castle, or in a university hall or a monastery, could house all the books the individual or institution owned. Sometimes when wall shelving became inadequate, the alcove arrangement of shelves was adopted (as in Hereford Cathedral, or the Cloister Library at Gloucester ca 1400), or sometimes the shelves were combined with desks for reading and writing, as in the Trinity Hall College Library. In the larger libraries the use of galleries permitted high wall shelving, sometimes extending several galleries high, a tradition that has lasted until the 1860's --- for example, the Peabody Library in Baltimore.

Perhaps the earliest attempts to design a library in the modern sense was a proposal by Leopold della Santa in 1816. (4) He proposed separate rooms for the staff, the readers and the books. His proposal was never adopted. One of the earliest library buildings with a separate book room was the Ste. Geneviêve library in Paris, designed by Henri Labrouste in 1843, and later the Bibliothèque Nationale in Paris, which contained a book stack room (maison des imprimís). (5) In 1852 Panizzi developed the circular reading room plan, found in the old Wolffenbütel Library (1706) without separate book rooms, into a large plan with book stacks surrounding the reading room. This plan was used in the British Museum and the Library of Congress.

In the Renaissance, the tradition of the monumental library building was established (the Bibliotica Laurenziana in Florence, the Vatican Library in Rome and many castles on the continent being examples). (6)

From the middle of the 19th Century to 1931, there was a steady evolution of the research library with various book storage arrangements and large monumental reading rooms. (7) All of these buildings were designed to fit one of the traditional architectural styles -- Gothic, Greek, Romanesque, or Georgian -- with the result that library functions had to be fitted into space requirements that were determined primarily by architectural considerations, not the needs of the functions themselves --- the classical modern example being the Lowe Library at Columbia University.

With the rapid growth of book collections in the last half of the 19th Century and the development of the modern university with its large enrollments, its many curricular patterns, its emphasis on graduate study and research and mass teaching, the old library form began to be obsolete and a hindrance by the turn of the century. University librarians began to regard the architect as an enemy(8) because he provided buildings that could not serve the library needs of the university. The architect, caught between the demands of the traditional concept of the library and the demands from librarians that were not clearly understood by the librarians themselves, struggled to evolve a library form that would satisfy both the traditions and the librarians.

It is clear now that no satisfactory form could have been evolved until the needs of the rapidly changing university could be stabilized and defined, until the public or private donors discarded their insistence on classical forms, until the technology of building construction could free the architect from the limitations of natural lighting and ventilations, and until a new school of architectural thought could be developed.

It was not until the 1930's that these factors matured sufficiently to permit the planning of a satisfactory research library building. In one sense we have moved abruptly from the renaissance castle to the modern skyscraper.

Because the modern university is still in the process of evolution in terms of rôle and teaching methods, librarians differ from one another in their concepts of the proper rôle a research library should play. For instance, within a five year span, two state supported universities in adjacent states (Wisconsin and Iowa) erected libraries that followed quite different concepts of what university library service should be, and no one claimed that either was right or wrong. The universities of Michigan and Illinois have completely different facilities for serving the library needs of their undergraduates, but they both have similar facilities for their researchers.

Local conditions, such as geography of the campus, curricula, relative emphasis on research, local traditions and relative wealth, vary so widely from university to university that each new library tends to be a law unto itself. Both librarians and architects tend to be highly individualistic. Architects, following the "form follows function" tradition, find that to merely wrap up space is not aesthetically satisfying to themselves or their public. They are striving to give the librarian the kind of space he needs but they are also trying to evolve a library form that will result in buildings that will look like libraries, not high school buildings or factories.

Librarians, at long last, have stopped complaining now that they have been given space that is adaptable, flexible, responsive to, and harmonious with the temper of the times. They feel confident they can serve the needs of the rapidly changing university in the foreseeable future.

I. The Objectives of Library Building Planners

Just as librarians at any one time differ in their conceptions of the rôle of a library, so during different times they have emphasized different functions. And yet the basic elements remain constant. In 1888 Talbot Williams' statement: (9)

> A model library will discharge three offices--- it will store the books in absolute safety from fire in an accessible manner, with light, air, and an average temperature, and with provision for indefinite expansion; it will provide space and room for rendering the books accessible to readers by adequate library administration; and lastly, it will furnish all classes of readers with the accommodations they demand, varying from the five minutes reading of the casual reader to the years of silent investigation by the historian

serves as a general statement of library building objectives for any time. The specific objectives of a building derive from the intent of the planners, the skill of the architect, the local conditions, and the assumptions currently held as to what libraries at that particular time are supposed to do.

Poole, in 1881, (10) proposed that library buildings be constructed in fireproof compartments (as was the Newberry Library) with each compartment containing all the literature of a given subject, that stairways be kept to a minimum, that buildings be easily heated, that there be good staff quarters, that there be good communication within the building, and that there be quiet reading quarters for staff and public.

Soule, in 1897, (11) found that librarians could agree on ten points: a library building should be designed for library work (not for some other purpose and then be converted into a library); each one should serve its

specific purpose; interiors should be planned before exterior design is considered; there should be no sacrifice in convenience for architecture; the plan should be adaptable; there should be simplicity of decoration; the plan should permit economical administration and supervision by a small staff; there should be as much natural light as possible, with high windows; and that arrangement of books in tiers around galleries is bad.

He also said, in 1902 (12) that, "another canon in planning is not to build so much beyond the present requirement... but to provide carefully, in advance, possibilities of easy and inexpensive expansion of each department."

Jast said in 1927 (13) that a "properly designed library is not, or ought not to be, a building containing books, but should consist of books contained in a building."

And in a similar vein Mauran said in 1926 (14) that, "taking into account the practical uses of the modern library it is readily seen that it needs a building planned from the inside, not from without, dictated by convenience, and not by taste, no matter how good."

Ranck, in 1926, (15) carried this idea further, saying, "the internal architecture, therefore, should be as free as possible from permanent walls and partitions so as to make it easy to adjust and rearrange to meet new needs and new conditions." And "buildings should be elastic, planned to permit easy and economical expansion, vertically and horizontally."

As did Barlow in 1949, (16) "the ideal building should be a 'hollow shell' type as advocated by Lamb. Permanent internal structures should be kept to a minimum. Movable partitions should be used to divide the various floors into rooms."

These statements are representative samples of the

general objectives librarians have expressed from the middle of the 19th Century to the present time. But it should be noted that no library built before World War II incorporated these objectives to such an extent that the buildings were able to meet new needs and conditions for more than a few decades.

After World War I, a period in which book collections in research libraries grew rapidly, university enrollments expanded, and curricula enlarged and proliferated, the older buildings, which had been planned with specific objectives but with non-adaptable interiors, began to interfere with the attempts of librarians to meet the new needs and conditions. This complaint is expressed in most statements by librarians about buildings of this period. Walter's statement in 1939 (17) expresses this:

> Maximum adaptability at minimum cost (is our objective now). This will certainly interfere with the old idea of a library building as a permanent architectural monument incapable of major changes. Such monuments are already for the most part obsolete, or diverted from their original use.

As did Githens in 1952, (18)

> The organization of a library is becoming more and more complex and the demands for a convenient interior more and more insistent. The effect of these trends has been revolutionary. A library building over twenty-five to thirty years of age is obsolete as an example to be followed, even though certain elements may be admirable.

And Ellsworth in 1955, (19)

> Architects (not librarians) planned libraries prior to 1931 and their conception of this

> function (judged by the results not their statement of intent) was that the entire building, and each part of it, even the corridors, was to be superlatively beautiful, a work of art. Each room was to be a beautiful, self-sufficient gem. Since truth was beautiful, and vice versa, the results would be truthful (i. e., useful) if they were beautiful. But around 1931 the idea of planning for use rather than monumentally began to emerge.

Between the two world wars, the objectives of research library planners seemed to be remarkably similar (so similar indeed that writers seldom bothered to state them in their articles) because the university libraries built in those years reflect the same general assumptions about how libraries should be arranged (see the University of Michigan, Illinois, Minnesota, California, Northwestern, Iowa State College, Yale, Missouri, etc.). These involved the following elements: A separate multi-tier book stack with carrels around the outer walls, a reserve room on the main floor, a general reference reading room, a periodical and newspaper, seminar rooms usually on the top floor, work rooms, and sometimes special quarters for departmental or research offices --- as in Butler Hall, Columbia. There were few exceptions. Wherever the influence of M. L. Raney was felt (Johns Hopkins and Chicago) an orientation expressed the following assumptions about library organization:

> The man who is training investigators needs an office, next to this a conference room, and adjoining this the library of his subject where students find quarters. (20)

Johns Hopkins expressed this by providing rows of offices next to the book stacks, near classrooms. In the Social Sciences building at Chicago, departmental offices were separated from seminars by corridors, both near a divisional library.

But with these two exceptions, and the Life Sciences Library at the University of California, most of the University library buildings fitted the pattern described above.

In the 1930's, the fundamental changes that had been evolving in American universities since World War I --- new curricula, new methods of inductive teaching, enlarged enrollments and new methods of research in the social sciences, put pressures on these library buildings they could not absorb. Increased dissatisfaction came to a head in the publication of Harvie Branscomb's book, "Teaching With Books, A Study of College Libraries," 1940, and in Wilhelm Munthe's, "American Librarianship from a European Angle," 1939. The common theme in these summations was that the libraries were not able to implement the needs of the teaching (as opposed to research) functions of the university or college.

Common complaints against the buildings were: a. imbalance between space allocated to reading rooms vs. stacks; b. impossibility of providing rooms for group studying, for the new machines used by scholars, and for the housing of personnel required for undergraduate reading room supervision; c. the mood of the buildings was not compatible with other contemporary buildings; d. difficulty in enlarging space for readers and books.

Branscomb's book did not create a new kind of objective for library buildings, but rather it summarized developments that were now ready for a new kind of expression. These centered around various ways of improving the "teaching" functions of the library, and of achieving the kind of internal adaptability that would permit a building to meet new circumstances and needs.

Boyd's account of the objectives of the Firestone Library at Princeton was one of the first well thought out statements of the new trend: (21)

> Those who expected to use this essential resource of teaching and research had been agreed for years upon the kind of building it should be. It would be a special implementation of Princeton's special type of education, conducive to individual study, convenient of access to books and services, inviting and informal in atmosphere. It would not be impersonal, institutionalized, regimented or forbidding. It would be grounded upon the conviction that the teachers in a university are not only those who occupy lecture platforms but also those who speak through the printed page; that those who teach and those who are taught must constantly renew their intellectual interchange from the heritage of knowledge preserved in books; and that this interchange reaches its greatest potential in the educational process when teachers, students, and books are brought into a harmonious relationship, as free from artificial and forbidding obstructions as possible. This conviction was not based on hypothesis. It had already proved its worth in the Marquand Library and in the libraries of the science and engineering departments.

In 1945 the State University of Iowa announced its objectives in a brochure, "The Library as a Teaching Instrument." (23) Here again the emphasis was on the concept of the library as a reading laboratory. (24) Service was to be organized according to the various academic levels of the students --- a "general education" room for freshmen and sophomores, reading rooms with selected collections of advanced materials for upper classmen, and the stacks for researchers. Near the reading rooms were to be seminars, conference rooms, audio-visual facilities and carrels of various types. The concept of service was similar to the one Ellsworth had developed in 1938 for the University of Colorado (25) but the physical setting was different. Princeton and Iowa

adopted Macdonald's modular method of planning. Except for the central core of facilities (toilets, stairwells, elevators, lifts, electrical controls, ducts, etc.) each part of the building was to be capable of housing any anticipated activity. (26)

The announcement of the Princeton and Iowa objectives in 1944, 1946 along with their adoption of the modular method of planning set the pattern which most universities have followed since, both in terms of objectives and physical provisions. Now that librarians could plan buildings with new concepts of service without running the risk of professional disgrace if the new ideas should prove to be failures, most new buildings usually contained some new variation on the traditional objectives.

The objective of internal flexibility is as old as the first writings of American university librarians, but until 1933 when Angus Macdonald first proposed his modular idea(27) the objective was never realized fully. The first American librarians to use early versions of his idea were the Library of Congress Annex(19) and the Colorado State College of Education in 1939. (28) The Swiss National Library in Berne used a partial application of the principle(29) in that part of the stack structure non-bearing walls and stacks columns spread some twelve feet apart in one direction permitted some flexibility. It would also be true that small libraries in "loft" type buildings possessed a measure of flexibility.

Typical of the new statements of objectives since 1945 are the following:

> Because much of the academic work on the St. Paul campus is intended to train scientists in the various fields of agriculture... the library attempts to give a laboratory type approach to the publications. The student is encouraged to learn how to locate information

> for himself in those publications he will need to know about during his future career. Open shelves, systematically arranged collections, provision of all available keys, guides and catalogs to information...are factors in this training. (29a)

In this library the University of Minnesota used modulàr planning.

The University of Hawaii sought five qualities: "comfort, efficiency, arrangement, adaptability and accessibility." (30) For comfort they used a cross-form with a wall of jalousies to catch breezes and also fluorescent lighting; for efficiency they used a close grouping of related functions; for flexibility they used modular construction; for accessibility --- open shelves.

Generalizations about library objectives are relatively useless because, as Darling states it, "Every library has a set of conditions peculiar to itself at the very outset of the planning. These conditions usually force us to part company with the theoretically ideal library at an early stage." (31) Or, as LeMaitre says, "There are as many plans as there are types of libraries, and these are multiplied by the varying local circumstances of site and public." (32)

In its many deliberations the Cooperative Committee on Library Building Plans found that on many objectives institutions could not agree one with another because the needs of the institution were different and the ideas of the librarians were different. (33) The Committee, however, found that its members could reach agreement on the following objectives as related to building arrangement, "The main floor should be near grade level and should include as many as possible of the heavily used departments of the library...so that the physical effort of extracting needed information and assistance from the library's collections may be kept at a minimum for clientele and staff. The only hope (of being able to

meet new needs) is to erect a building which will provide as much flexibility as modern construction methods permit. This principle should apply not only to interior but also to exterior. Libraries should be designed and located so expansion may occur easily and so that the interior may be reorganized easily and efficiently. (34)

Pickens in describing the attempts of Washington University to solve its library problem, expressed similar views in the following terms, "Why should a university library demand any more competence on the part of the architect than do other college buildings? (Because it involves) the most important form problem of expressing the heart of an educational institution in such a way that the projected building form will symbolize the university and inspire students for years to come. On basic concepts librarians disagree but modular structures and the open plan have licked this problem..." (35)

At the present time, therefore, it is customary for each university planning a library to inquire into its own needs and unique characteristics as the basis for its library objectives, which can now be expressed in a building that will in a very practical and real sense, permit the implementing of these objectives. Each set of objectives is appropriate for the parent university only. Buildings which externally may resemble each other, will frequently show quite different conceptions of service and arrangement. (Washington State College and the State University of Iowa, for example.)

Because the post World War II university libraries differed so widely from one another in concept of service, thus revealing basic differences in the universities themselves, one might conclude from the prewar libraries, which were similar in organization and structure (Illinois, Stanford, Michigan and California, for example) that these universities in the prewar days were not very different from one another. This assumption would

be a mistake. The similarity of the older buildings was caused by the state of the building technology of the time, the domination of a rigid concept of architectural style, and the fact that librarians had little to say about the planning of libraries. (36)

Today, a new building technology, a new concept of aesthetics, and a new rôle in planning by librarians results in a flowering of a wide variety of university and college library buildings. Behind this new building technology and concept of aesthetics stand generations of statements by librarians asking for buildings that would permit freedom of adaption.

In 1939, Walter (37) stressed that university functions are changing rapidly and that, "elasticity of use and ease of modification of specific parts of the building... are the most outstanding needs of a university library building that will serve the future as well as the present."

Sayers (38) in his writings from 1944 on, stresses in England the need for flexibility so that each generation can be free to solve its own problems.

Ellsworth's analysis in 1937 of the library needs of the University of Colorado led him to the conclusion that internal flexibility was essential and caused him to look to the Macdonald suggestion of "unit" planning. (40)

Kilham, in discussing the Princeton Library said, (41) "In November, 1944, the Princeton trustee committee decided that the lack of flexibility of the earlier plans was a drawback which had been developed during the war, which could be easily adapted to new conditions."

Merritt in 1947 (42) observed that, "the recently growing tendencies favoring making many books available to all readers is forcing an evolution in library design toward buildings with greater internal flexibility."

And Holdsworth, speaking of the University of Melbourne Library in 1946 (43) hoped that, "it be as flexible and adaptable as possible, that it be a library with almost completely open accessibility, and that it shall be comfortable to work in and aesthetically pleasing."

Florida State University (44) believed that, "since the mechanical and technological discoveries of this age necessitate frequent changes in library procedures the building is designed with a simplicity of structure that gives maximum flexibility."

The same emphasis on the fact that since objectives change so rapidly the only way to protect the future is to use the principle of flexibility is found so abundantly in the literature that further elaboration is unnecessary. Typical statements can be found by the following writers: Boyd, (45) Burchard, David and Boyd, (46) Patterson, (47) Macdonald, (48) Walter, (49) and Kuhlman. (50)

II. Planning A Building - Planning Principles, Methods and Procedures

It would appear that there should be no great difficulty in discovering the right method of planning a research library, and yet the history of building planning suggests that there have been, in modern times, great difficulties and much caution over just how to go about the planning. There appear to be several reasons why this is so.

First: As stated by Mauran in 1901 (51)

> The problem presented to an architect by a library board is always essentially a new one. Certain fundamental rules may obtain through their universal applicability, but every step in the working out of a successful plan must be influenced by the particular conditions referred to, thus the cooperation of the

> librarian is of inestimable value to the architects.

It seems to be true that although it is possible to develop general principles that sound reasonable, the application of these principles to each particular library encounters different conditions, not just in terms of the functions of each specific building, or the physical factors involved but also because there is always a different human equation involved among the architect, the librarian and the officials of the institution involved.

Second, it is clear from the literature, although seldom stated directly, that building-planning will depend on background factors: The rôle and status of the architect and the librarian; the extent to which the public, through the instrument of government, enters into the planning by means of laws and codes that determine the planning procedures;(52) the degree of development of building technology; and the presence or absence of architects and engineers of skill and ability. The degree to which adequate financial support is available will also determine the planning procedures. They tend to be more sophisticated when a good many libraries are being planned at one time than when few buildings are being erected.

The kind of planning that could be done in the 18th Century, when Burgoyne says that:(53)

> The Government in 1753 bought (for the British Museum) a mansion that happened to be vacant, but were fortunate in their choice,

would not be contemplated in the 1950's if another British Museum had to be built.

There have been many statements outlining general principles that should be followed. Some of the better known ones are: The Githens-Wheeler Principles (54)

Thirty-Three Points:

These principles are not presented as merely personal tenets of the authors. They are generally accepted and we believe may be regarded as axiomatic.

1. A satisfactory library building can be evolved only through long, careful, joint study on the part of the architect, the librarian, and the building committee of the Library Board.

2. Proposals to give any community a new public library building without expense offer an opportunity and an obligation for the Library Board to discuss with the donor of the site, plan and design, and with the tax appropriating body the necessity of adequate support.

3. Too heavy an investment in building costs in proportion to population or to annual library appropriations may result in inadequate financing for the library service, for too much may be required for heat, light and upkeep.

4. In small communities and in branch neighborhoods, the advantages and disadvantages of temporary and rented quarters should be studied and compared with those of a permanent building. In small communities a special or permanent building is not always necessary for successful library work.

5. One should be prepared to resist all ill-considered ideas on the part of self-seeking or misguided individuals or groups, even if urged by the press, by prominent citizens, or by politicians.

6. Many errors may be prevented by the appointment at an early date of a competent trained librarian, if the library does not have one.

7. If a local architect inexperienced in library planning is appointed, directly or by competition, someone familiar with library planning must be retained, either a librarian as adviser or a consulting architect, and his services utilized from the beginning of the project until its completion.

8. The location of the library should attract and serve the greatest possible number of people.

9. The building should be planned and designed to be appropriate and adequate for the special type of library work to be done and the community to be served.

10. Each library should profit from the ideas, plans, and experience of other communities and libraries, but to get the best results should not copy blindly.

11. The planning of the interior of the building as to important rooms and their relationship and arrangement is necessary before the exterior is designed. Arrangement is discussed in Chapter 33.

12. Beginning with the early stages of the planning, the architect should study the recommendations of the librarian and a committee of the staff, as to proper placement of all service desks, catalogs, furniture and equipment. These should form an integral part of the planning of each room, and thus

avoid either the appearance or the consequences of being an afterthought.

13. Convenience and beauty are common goals; time should be taken to attain both. "Architecture is of all the arts the one most continually before our eyes."

14. Provide for growth and change, and the flexible arrangement that will insure them.

15. Fireproof construction should be considered, but in a small library its cost may not be justified.

16. Noise-reduction through the use of acoustic materials is advisable.

17. Challenge all proposals to house a museum, art gallery, public auditorium, or any other non-library community activity in the library building.

18. Features that attract sightseers should not be placed in the reading rooms. Space should not be taken up by halls, rotundas, domes, great stairways or other features that do not contribute to the purpose of the library.

19. The community should be attracted to the building by an inviting exterior in which the window area is in generous proportion, and by a sidewalk level entrance, exterior and interior exhibits of books and the sight of books visible from the entrance.

20. The interior should be arranged economically, i.e., simply, as to expense of structure and saving in travel.

21. The rooms, their proximity, their equipment, and their communication should be arranged to provide the most complete supervision with fewest possible attendants.

22. Provide adequate work space for the public service staff in proximity to the major portion of their respective tasks, and if possible where they may unobtrusively supervise the readers and be quickly at their services.

23. Adequate quarters should be provided, furnished and equipped for the comfort and convenience of the staff.

24. Except in large libraries, the trustees' and librarian's room may be combined.

25. An adequate Children's Room should be provided, and perhaps a separate entrance for children.

26. The needs of "intermediates," or high school students, of the great 14 to 20-year-old group, who no longer wish to be treated as children, should be recognized, by giving them special quarters or space for a. leisure reading and b. school reference work, with adult books available, but without disturbing adult readers.

27. It is necessary to have open shelving for as large a proportion as possible of "live" books and periodicals, both adult and juvenile, making them easily accessible to readers.

28. Considerable additional shelving should be arranged for stocks of less-used material, "retired" books, and material in process

of preparation, or waiting for possible use.

29. Older, less used books should be continually relegated from open shelves as essential to economy, and to meet changing public demands. Stacks and shelving, even more than the general plan and structrue, must provide for the possibility of frequent shifts.

30. In libraries in communities large enough to require storage stacks of considerable capacity and several levels, they should be located to give a. quick access by the staff and prompt delivery of books to readers on request, b. the least obstacle to and interference with readers in their use of and access to the most frequented rooms.

31. Developments in book elevators and carriers have made multi-level storage stacks acceptable, while developments in lighting and ventilation have made acceptable interior stacks which have no outside outlets or daylight.

32. There should be as much regulated natural light as possible in all reading rooms and work rooms, with windows extending to the ceiling.

33. A library building should be the best lighted of all public buildings. Interior artificial lighting should be scientifically planned to combine unobtrusive beauty of fixtures with a minimum of glare from direct light, and a maximum of diffused light (including the lighting of reading room and work room corners).

The Burgoyne statement: (55)

> The history of all library architecture is pregnant with two especial morals---the need of building from the first upon some well-considered plan, so prepared as to admit of harmonious development in the future, and the necessity of making extremely generous estimates in respect of space.

The League of Library Commissions statement: (56)

> Before plans are drawn, the Board, acting on the advice of its librarian or a representative of the State Commission, should make a statement as to the rooms needed; the relative location of these rooms necessary to economy in administration; the number of square feet and the shelving capacity for each; the exposure preferred, and the natural light, as determined by the book cases for the present and future.

The Gilbert Underwood statement: (57)

> I would study it first to make it the most perfect machine for its job. I would try to think of its functioning fifty or a hundred years from now. Then I would study its facades to tell honestly the story of the plan on the outside. I would not hang a "style" on it; I would create the style out of function and materials. When it was completed I would expect it to be a building in which the complex techniques of modern library service could function smoothly and efficiently, and which would suggest in its very structure something of the beauty of the cultural heritage which library service exists to preserve and pass on.

The Metcalf statement: (58)

> Metcalf says that the librarian must develop a

philosophy or principles on which to base plans, and be able to describe these. Consult the architect about who is to write the program. Sometimes the librarian should do this and sometimes the architect should. "Circumstances alter cases."

It is important that "the librarian himself has found out what he wants, not just in mathematical terms but in practical results, and that he be prepared himself...to discuss intelligently with the architect the problems that will come up. He must be able to talk the same language as the architect so that the latter will know what he is talking about when he tries to make a point.

Seven points for the librarian to follow:

1. Learn as much as possible about planning.
2. Learn all he can about the institution.
3. Discuss the problems with faculty, staff, etc.
4. Study site problems.
5. Study the architect.
6. Know about building codes.
7. Know his own library philosophy.

The Cooperative Committee on Library Building Plans approach: (59)

> The planning of new buildings took on a new aspect during World War II when the Cooperative Committee on Library Building Plans was organized. A group of strong minded and highly articulate librarians, some of the country's best architects, and representatives of library equipment firms sat down to talk out the problems of planning libraries. There was mutual respect on all sides of the table.

And many short general statements of principles: (60), (61), (62), (63), (64), (65), (66), (67), (68), (69), (70).

Contemporary Planning

Since World War II planning research libraries in the United States, primarily as the result of the work of the Cooperative Committee on Library Plans of large libraries, has followed a standard pattern that involves the following elements:

1. A written program.

2. The use of an expert consultant.

3. Formal group criticism of the program and plans of proposed buildings.

4. Proper use of the knowledge and talent of the librarian and architect involved with each building.

It is now assumed that each building project will start with a written program. (71)

> The first step in planning a library building clearly should be a formulation of the service which the projected building is intended to house.

Higgins said that, "the program is to planning what specifications are to purchasing." (72)

Beals said that "a program is not much more than a carefully written detailed statement of the plan of service," (73) and that it does four things: a. offers a precise statement of the ends the library serves; b. describes the plan of service by which the library intends to achieve the ends; c. quantifies all factors; and d. will show the extent of inter-relationships. (74)

Kaplan said that the librarian in writing a program "should assemble the data that you as a librarian rate as an expert on." (75)

The minutes of the various sessions of the Cooperative Planning Committee on Large Buildings and its successor, the A. C. R. L. Library Building Plans Institute, as well as the Burchard, David and Boyd volume summarizing the various sessions of the Cooperative Planning Committee contain extensive discussions of the elements that go into the program. A short summary of this large body of reporting is contained in Reece's statement to the effect that the fundamentals of a program are that it is written by or with persons intimately connected with the building; that it should reflect the needs of the building; that it should be based on all relevant data from the institution; that it should define all conditions needed; and that it should provide a building that would be practical, easily operated, adaptable and expansible. (76)

Reese said the program should give the architect, in addition to the usual data, knowledge of the money available, all relevant information on the site, and on the campus circulation patterns. He pointed out that there were several controversial points in program writing.

1. Sometimes architects expect a space budget, which librarians do not always know how to provide.

2. In the placing of functions, architects want statements of relationships of work and functions, whereas librarians frequently do not know this.

3. In drawing preliminary sketches, architects differ in their desire to have the librarians do this.

4. In the technical aspects, most librarians expect this to be the responsibility of the architect but some librarians want to have the right to contribute on this point.

5. In presenting alternate ideas, too, there is a difference of opinion as to whether the program should present just one or many.

On the matter of the use of an expert consultant, there is complete agreement among all writers that such an expert should be used. Sometimes the consultant is a librarian who has participated in the planning of several buildings; sometimes he is an architect who has done several buildings; and sometimes a man from the library equipment industry is used.

Soule mentioned that "it will be wise to get advice from some librarian who has had practical experience, not only in managing a library, but also in planning a library" (77) and that "the third most common extravagance is parsimony in expert's fee." (78)

Githens and Wheeler say that "librarians increasingly follow the practice of enjoying the services of a competent adviser, either an architect who has specialized in libraries, or a librarian who has had considerable experience in planning." (79) The consultant can be "especially important at the early stage, the situation must be analyzed, the size and location of the proposed library discussed, and the list of departments and services made." (80)

Although the literature is relatively silent on the specific functions of the consultant, and although the functions will vary from library to library, it is customary for a consultant to study the library needs of the institution, write a program for the library, work with the architect in expressing the program and in developing the building. Sometimes he assists with the selection of equipment and furniture. The amount of time he spends on a specific job varies widely depending upon the complexity of the job. Fees charged for this work vary from job to job and among the consultants. For major projects one thousand dollars a week is considered a normal fee. For short consultations

$100.00 a day plus expenses is standard.

The formal group criticism of the program and plans method began with the organization of the Cooperative Committee on Library Building Plans at the end of World War II. The first meeting was held in 1944. The general purpose of the group was, (81)

> It was our belief that the problems common to the planning of all university library buildings could be most effectively met by bringing into focus the best available expert opinion on their problems... It has tried to be helpful... bringing to bear on a concrete load situation the best and most expert thought at its disposal.

The group consisted of architects, and librarians of universities that were planning new libraries. Sometimes representatives from library equipment firms and specialists from other disciplines met with the group. The method used was to give each university a chance to present its plans, after which extensive criticism and discussion of the plans took place. Since the work of the various sessions has been published both in the form of minutes of each meeting and a summary volume, "Planning the University Library Building," detailed conclusions will not be given at this point.

The success of the Cooperative Committee meetings in improving the building plans discussed could be attributed to three factors, the high level of quality of the original group, the willingness of the group to be ruthless in their criticisms, and the fact that the group was small.

The nature of the Committee changed when the original group of librarians dropped out after their libraries were completed. The A. C. R. L. took over the organization and named it the A. C. R. L. Building Institute. Although an attempt was made to retain the

flavor and methods of the Cooperative Committee, this was impossible. The group became larger and began to spend small amounts of time on a larger number of presentations.

Lastly, it is customary now for most institutions to make proper use of the knowledge and talent of both librarians and architects in planning.

The early articles on the relative rôle of the librarian and architect usually consist of laments over the fact that librarians seldom had any voice in planning libraries. This is reflected in the following news item in an architectural magazine in 1882:(82)

> The Convention of the A. L. A.... amused itself, as usual, by falling foul of the architects, over whose prostrate forms every scientific hobby is made to prance beginning with the maxim laid down by the president of the A. L. A. that "the architect is the natural enemy of the librarian"...

Bostwick notes that, "the worst possible combination is that of the Board and Architect, the librarian being ignored." (83)

Offor says that three of four libraries in England have been planned without a librarian. (84)

Ellsworth notes that "times have changed, today the librarian and a planning committee control the early stages of planning. They write the program and lay down the description of the functions the building is to serve. The architects' task is to create a building that will perform the functions described in the program." (85)

There has been, and still is, difference of opinion as to the exact rôle the librarian and architect should perform in the early stages of planning. Some librarians would keep the architect pretty much out of it.

Raney said that for two buildings he had prepared building plans and had obtained faculty and administrative approval before an architect was hired. All the architect had to do was "graceful expression." (86)

Jast commented more bitterly that: (87)

> The architect regards the building primarily a "composition" whereas the librarian regards a library primarily as a variety of related spaces with certain equipment, and the building is just a protection against wind and weather.

Concerning the rôle of the architect, Kaplan noted that: (88)

> The record of our architects is not such that they can finish us off so easily... A good architect will encourage you to participate in all decisions because he realizes that in ways unknown to him some of the decisions he makes will seriously affect the librarian.

Kaplan also says that he thinks librarians should check all details on working drawings and shop drawings too.

> Ideal situation is one in which the architect shows the librarian too many rather than too few details.

Wilson says that: (89)

> The librarian has an important role in this preliminary planning. He should work closely with the building committee in preparing specifications and should pay particular attention to such matters as the functions of the various rooms, the relationships among them, the probable use of the building and its supervision, the flexibility of its interior, provisions

for future expansion, and probable cost of operation.

Randall states that: (90)

After a close study of function, it is the business of the librarian to tell the architect what is needed in terms the architect can understand. Requirements, if they are to have meaning for the architect, must be given in particular and specific terms which have structural meaning and not in library terms which have meaning only to librarians.

He stresses the idea that a program must really tell the architect what each part of the building is to do.

And Burchard, David and Boyd say that: (91)

A minimum requirement for a successfully planned library can be categorically stated: The librarian must be a part of the authority set up by the university in the earliest stages of library planning; he must be constantly in touch with the architect through all states of planning; he and his advice on what the university needs for a library must have greater weight than that of the architect or the donor.

And Githens and Wheeler say that: (92)

Role of architect begins after the librarian and the university officials have outlined the basic service needs of the structure.

Jallade, an architect, notes that: (93)

Plans must start with concept of books waiting on shelves for readers and the building must be designed around the circulation of books and the convenience of readers....When libraries have

been built as purely architectural problems, they have been unsuccessful.

On the other hand, James Gamble Rogers observed that: (94)

> After years of practice I have finally learned one thing. A great building is not made by a great architect. It is made by a combination of a great architect, a great builder, and most important of all, a wise client.

He urged librarians to give their problems not the answers to those problems.

And Metcalf notes that: (95)

> A great architect and a first class librarian will not insure a satisfactory library building; the results may depend more on the effectiveness of their teamwork than on the natural ability and competence of either or both.

There is a general agreement, however, that the librarian must be able to spell out the problem before the architect can do his part. The following statements are representative.

Wheeler and Githens say that the architect cannot plan a building until he understands the building needs thoroughly. (96) Same as has been expressed in most articles on the subject.

Foster says that: (97)

> The architect is entitled to precise information as to what the librarian would prefer to have, if he could get it.

Foster holds that there are four inevitable conflicts between the librarian and architect, but that they can

pool their conflicts and resolve them.

Burchard thinks a librarian must be entirely sure of his program if he expects an architect to express it well --- before the architect is hired. (98)

The specific items to be included in each program will differ from library to library, just as the architects' expression of the program will be unique for each building. The only elements that are in common are the procedures and methods used in completing the program and developing the plan.

Rôle of Boards of Trustees, Library Boards, Library Committees

Because institutions planning research libraries usually possess central executive officers who do the administrative work, the rôle of Boards, etc. is usually limited to such questions as selection of site, architect, and to the style of the building.

Selection of the site is always a local problem. It has been taken for granted by planners in the past that a university library should be located close to the classroom and office buildings, particularly the ones in which the humanities and social sciences are housed. Byrd (99) questions this and thinks it more important that the library be near dormitories and the student union building. Although most institutions claim they try to locate the library where it will receive the heaviest use, and where it can be expanded indefinitely, no principles for determining the ideal place for a library have ever been developed. The rapid growth of universities since 1956 makes the question of centrality a more or less academic question in most universities.

The selection of an architect is done in so many ways and for so many reasons that no principles can be found in the literature. The question of architectural

competitions is still a matter of debate. In recent years the only university to use this procedure was Washington University in St. Louis, and it did so for purely local reasons. Architectural competitions are more commonly held in Europe.

Githens and Wheeler summarize the arguments for and against competition as follows: (100)

Arguments in favor of a competition are:

1. Fair play and an equal opportunity for all.

2. Different men at work on the same problem will probably develop most of the possible solutions and the best can be chosen.

3. New and brilliant solutions may come from younger men unknown to the committee.

Arguments against it are:

1. Delay and expense.

2. Danger of an incomplete program, for it is solely on this basis that the plans will be developed and the award made.

3. Delegating the solution of an architect to a jury of fellow architects, perhaps on the basis of a plan solving the problem according to the program, but one which librarians and trustees may not like. The librarian should not be a member of the jury because the jury cannot consider any information or instructions that are not contained in the program and must base their decision on the information the competition have and no more.

4. Danger that the members of the jury may

not know the library problem sufficiently and select a plan that will not function properly.

5. If the competition is open to any qualified architect and a great number of competitors is likely, the ablest architects may not enter since there is a probability of gaining nothing and losing prestige.

6. Danger of selecting a brilliant but inexperienced man incapable of properly carrying out the many important details of the particular building operation in question.

7. Danger that a competitor may be guided by brilliant men he has retained especially to work on the competitive drawings; and on winning, the competitor may carry out the working drawings with his regular staff that may be quite unable to develop a building with the excellence of the competitive drawings.

8. The possibility that not one sound solution may be presented, so the jury would be required to give the award to an inferior design with the hope that the author would change it before the contract drawings were begun.

9. During the progress of the competition the competitors have no opportunity to collaborate with the librarian, thus preventing an exchange of ideas essential to the proper development of this highly specialized problem in the early stage...

"A competition can be successful only if based on a well thought out program and coordinated according to the A. I. A. standards."

Soule comments wryly that architectural competitions are an extravagance, and that it is better to hire a consultant. (101)

There are probably as many rôles played by Boards of Trustees as there are research library buildings because the Board is a kind of buffer agency between the taxpayer or donor and the administrators of the institution that is planning a building, and the possibilities for variation in rôles are numerous. Soule,(102) speaking probably for public rather than university libraries, said ironically that,

> But a board of trustees, often composed of elderly men, may be ultraconservative, remembering and clinging to the memory of library methods and especially old styles of library buildings, current when they were young. If they are wise enough, however, to choose a building committee of sane and openminded men, whose recommendations, founded on expert advice, they will listen to, those Voteries of tradition, will not prove too obstructive.

Boards frequently go far beyond this. They may choose the architect, select the building site, determine the amount of money to be spent, determine the style of building to be followed, and even attempt to plan the building --- if they delegate authority to a sub-building committee, this committee, too, may give all responsibility to the administrators in charge of the project, or they may see the building through all stages of planning and construction. Wilson says that the "function of the building committee is to make a thorough study of the library needs of the institution and to accumulate the data necessary for planning a suitable structure" (103) --- a rôle which in some institutions may be done by the librarian, the architect or the consultant.

In short, the rôle will vary from one library to the next and no generalizations are possible.

Factors That Determine The Nature of The Planning Method

The conception of design held by architect and owner.

Theories of what a library should look like run parallel to general architectural theories at any single time.

In 1897 Willard described H. H. Richardson's theories as follows: (104)

> He (H. H. Richardson) composed his parts separately, his book room, his reading and librarians room, his art gallery, and his entrance and his stairway, and put them together without any attempt to produce a symetric whole: When his structure was finished it was a simple aggregation of parts, each of which had its function and each of which revealed its function by the peculiar shape which had been given to it. An archaeologist of a thousand years hence, coming on the extinct organism of the university library, could easily tell by analysis what it was meant for, just as a paleontologist could tell by the examination of a skeleton.

He also noted that, (105)

> The tendency at present in our large libraries is a tendency toward mammoth reading rooms, where three to four hundred persons, each of whom is doing an absolutely independent and separate work, are thrown together like a regiment engaged in a united movement.

A large mass of literature on the way architects

designed libraries prior to 1930 can be summarized as follows: (106)

> Architects planned libraries prior to 1931 and their conception of the functions (---judged by the results not their statements of intent) was that the entire building, and each part of it, even the corridors, was to be superlatively beautiful, a work of art...

Architects knew that they were expected to produce a monumental building, and tried to do so. They assumed, as did most librarians, that each room or area could be designed for a specific function of a known and predictable size. The site chosen for the library was in the center of the campus, with the result that, as Burchard said, "...the library is in the center of the campus and is treated as a show case with facades that can't be changed." (107)

Librarians had little or nothing to say about what the buildings should look like, or how they should function. Their job was to accept the building that had been planned by others and to operate it as a library. There were librarians and architects that knew this method of planning was wrong, but there are few instances when the improper method was discarded.

Since World War II, architects have not dominated the planning of libraries in an improper sense. Modular buildings are, in one sense, a denial of the old architectural concept of planning. They are, to some extent, formless, and have no architectural quality at all. This does not seem to disturb many contemporary architects, but some are profoundly worried by the effect on man of the abandonment of traditional designing. Dean Hudnut of Harvard in 1947 warned that in accepting the present theory of "formless" design and modular building librarians were betraying their trust, (108)

A double servitude to art --- and to the scholarship of art --- united architect and librarian. Whatever the differences between them, they yet had in common the consciousness of a mission shared together. They were priests at one altar, however strange their liturgies. Neither had yet learned to think of himself as scientist; neither had discovered an explanation for his existence in the techniques of his craft; and neither thought it necessary to assemble his love of beauty under a glass of popular sympathies and professions of social serviceability. Both were essentially guardians of ancient fires and were resolute that these should again illumine our land...

The Renaissance forms with which librarians and architects clothe their buildings are surely symbols of this sympathy with a tradition parallel to their own, these columns and arches, these pediments, domes, and vaulted halls were, no doubt, the consequence of many and diverse currents of taste, but they could not have become so universally the canonicals of libraries had they not offered the librarian satisfactions congenial to the movement of his own mind. Beyond the dignity which they conferred upon him ---beyond the assurance of an aristocratic lineage and of his permanence in the scheme of the world---they confirmed his devotion to those humanities which this, the architecture of humanism, also celebrated...

How shall we explain the impediments which now threaten this true marriage which seemed to assure so great a happiness to those whom it united?...If the architecture has lost faith in that classical tradition...he is, nevertheless loyal to that wider tradition of which the classical is only one phase: I mean, of course, the tradition of form in buildings...

> The true cause is a change in the nature of the librarian. The true causes are the invention and development of a complex of concepts and procedures known as "library techniques" together with that field of speculation called the Science of Society, the gradual command of these over the imagination of librarians, the chilly transformations which overcome the nature and mental processes of those who yield to their seductions.
>
> So one could read a book unaware of the style, the structure of its thought, the imagery which decorates its pages; learn the case history of a man without noting the uniqueness of his mind and spirit, and spend a lifetime in a building unresponsive to the solicitations of its architecture...
>
> I sometimes think that this machine concept which has removed the library building from the consciousness of the librarian has also removed it from that of the public. People apprehend these buildings in a new way; they no longer appear to us as objects to be contemplated, analyzed, understood; we do not look at them; they are the little noticed servants who wait upon us, and unless by chance they get in our way, are invisible.

If Hudnut is right the formlessness of the modular method planning will cease eventually to be used. It may be, of course, that the new formlessness is merely a new form, which will be reorganized as such by future generations. Contemporary librarians know that the traditional "form" buildings cannot meet the needs of the time, and that the so called formless ones can.

Planning - New Methods and Techniques

I. A new refinement in planning has developed in recent years particularly in special libraries, based on a careful job analysis of the activities that occur in a library. R. A. Miller stated this method for planning space for technical and administrative functions as follows: (109)

> The librarian should list the tasks to be performed, and in which departments; he should make a job description and analysis; he should prepare a chart of organization and he should make a list of equipment...

Typical of the many articles on this method is the Hilligan outline: (110)

1. Read the literature of the building.

2. Make inventory of the following information:

   a. Present book stock
   b. Rate of growth
   c. Rate of discarding
   d. Average number of volumes off the shelves in circulation
   e. Preparation of stacks that can go to storage
   f. Open or closed stack policy
   g. Special types of material
   h. Special study features

3. Prepare list of services and planning for work flow; the results of which would be:

   a. A checklist of tasks
   b. An organization chart
   c. A job description
   d. Charts of routine
   e. Lists of equipment

4. Report to management including:

   a. Capacities for books, etc.
   b. Reading and circulation areas
   c. Equipment
   d. Staff operations
   e. Storage
   f. Exhibits
   g. Expansion
   h. Physical factors, such as lighting, heating, cooling

5. Making adjustments to physical factors that will eventually govern the plans.

This kind of exact analysis of activities and quantification of the same is much easier to do in a relatively small special library than it is in a large university research library, where there are many factors that defy objective description or exact quantification. Yet this is essentially the same process the librarians attempt to use in writing a program for a large library. Job analysis and preparation of flow charts for technical and administrative operations are not uncommon but for public service they are characterized by their absence in general university library planning.

II. The second new concept is that of modular planning. Essentially this is a method of planning possible only in a modular building in which, theoretically, each square foot of floor space is capable of containing any library function. Thus, in theory, in planning a modular building one need only make certain, in advance, that the building is large enough to house the operations to be carried on there. In practice, this is possible only in part. There are certain fixed elements--- lobbies, stairwells, toilets, ducts, auditoriums, elevators, lifts, pneumatic tubes, etc., that must be located in advance in such a way they will not interfere with library operations. Lighting controls cannot be moved around, and air supply outlets must be located where

they will be needed.

Nevertheless, in modular planning, although usually the planners take the same care they would in planning a fixed function type of building, many of the space layouts can later be altered to suit the desires and needs of the librarian in charge. The essential elements in this method were stated by Ellsworth in 1953 as follows: (111)

1. The method is not exclusively associated with any one concept of library organization.

2. The method can be used in any architectural style of building, but is most economically used in a rectangular shaped building. The method does, however, clash with the traditional concept of architectural aesthetics.

3. The question of whether in the long run modular planning is more or less expensive than fixed function planning cannot be answered now. Librarians who manage modular libraries would be inclined to include under costs a good many other factors than the initial cost of the structure.

4. The structural devices used can vary from building to building. Ceiling heights, for instance, can be as low as eight feet or as high as perhaps nine and one-half feet without sacrificing economy unless a type of floor construction is used that results in a situation where the addition of slightly more ceiling height would provide space for an intermediate stack floor.

   Likewise, the question of the size of the horizontal dimensions of the module has been much debated. One finds a wide variety of dimensions used and one finds a variety of

reasons given for these dimensions. These will be discussed in Part IV of the report.

5. The problem of light, heat, and cooling controls is more difficult than in a fixed function building.

6. The modular method may not be applicable to all buildings. For instance in buildings largely devoted to book storage, in which there is little likelihood of moving the bulk of the books, the method would not be appropriate.

Planning - The Factor of Obsolescence

In view of the fact that large research libraries, as they are known today, are all less than one hundred years old, it is not surprising that little is known about how to estimate the life of a research library building.

Randall (112) summed up one point of view common in America in saying that "since library functions change, library buildings can't remain good very long." He was referring to a fixed function type of library. Cunningham (113) in 1931 said that each generation will need a different type of building and he argued for not trying to build libraries that will last forever. Leupp (114) stated the same point of view and observed that buildings can't last more than twenty to twenty-five years. A logical approach would be to build inexpensive and flexible buildings.

Members of the Cooperative Committee on Library Building Plans at various times attempted to visualize a truly inexpensive and adaptable building that would embody the concept expressed above but no university official has been willing by 1958 to plan a building on this basis. Instead, each attempts to plan a permanent, long life building that will postpone the ravages of

obsolescence as long as possible by using all the known ideas for making each building expandable and adaptable, including such concepts as the Harvard program of having a different type of building for each of four major types of material and use --- undergraduate, graduate, rare books and storage.

Other lines of approach to postponing obsolescence are the use of microphotographic and cooperative collecting agreements.

But as of now, no one has come to grips with the basic problem of designing a library that would have a maximum life but that could be so inexpensive that it could be abandoned after a reasonable period of usefulness. One major difficulty is that on most university campuses there is seldom more than one proper site for a library.

III. Library Functions To Be Performed --- How Libraries Have Tried to House Them

A. Space for Readers

The nature of the provisions libraries offer for readers vary, of course, from library to library according to the ideas the planners of each library had in mind. The assumptions each librarian makes in planning a building vary with time and place. In the newer libraries in England, France, Germany, and Switzerland, for instance, it is assumed that students will use the central library not to read their own books as they do in the United States, (115) but to consult the library materials as reference or research collectors. They expect to do their reading in their own rooms. This is true in such universities as Cambridge, Manchester, Leeds, Liverpool, Caen, Hamburg, and Frankfurt. Patterson (116) observed that in Great Britain a normal allowance for readers would be ten to twenty per cent. On the Continent, the allowance would be

closer to ten per cent than to twenty per cent.

In the United States practice varies widely as can be seen from the provisions that exist and from representative statements.

Tilton in 1912 (117) said that a library should seat one-half the enrollment; Warner and Brown in 1928 (118) think twenty-five per cent reasonable but think this may be too low; Larsen in 1951 (119) said that library buildings should be planned for fifty per cent of the student body; Gerould in 1932 (120) says that thirty per cent is almost a minimum and that it should be fifty per cent; Beaux Arts Institute suggested fifty per cent; (121) the A. L. A. Committee on College and University post war libraries in 1946 (122) said, "not so long ago a college library that could seat ten per cent of the student body was regarded as providing adequate study facilities. Recently the minimum has been advanced to twenty-five per cent to thirty-three per cent." Darling (123) said that for the U. C. L. A. Bio-medical library: "Twenty-five per cent seemed reasonable and practical." Muller in 1950 (124) noted that the larger institutions in the post war buildings tend to provide seats for ten to twenty per cent of their students; Githens in 1952 (125) said that, "Sufficient seats for twenty-five per cent of the student body is now considered minimum and forty to fifty per cent desirable;" Reece in 1952 (126) observed that "norms have risen in a few decades from ten to fifty per cent, or even sixty per cent;" Janney mentions in 1954 (127) twenty-five per cent as "conventional" figure but says it may be unrealistic; Byrd in 1957 (128) says thirty per cent has traditionally been considered minimal; Brock in 1958 (129) found in 1951 that only sixteen out of eighty-seven libraries provided seats for only twenty per cent of their enrollment but assures that twenty-five per cent is normal.

In 1949 Burchard, David and Boyd (130) said that the number of seats in the central library depends

much less on the number of books in the library in relation to the number of students on the campus than it does on the total number of study and recreational spaces available elsewhere. Metcalf (131) says that there is no known formula. At Harvard they provided three chairs for eight undergraduates if the library is decentralized and more if centralized.

B. Space for Books and Other Library Materials

Separate provisions for the storage of books did not become necessary until the last half of the Nineteenth Century. (132) The British Museum in 1852 and Bibliothèque Nationale in the 1850's were first to use the multi-tier idea. In the 1870's Windsor of Harvard began plans for a separate book stack. (133) Since that time, until World War II, the use of the separate multi-tier stack was universal in research libraries. With the advent of the modular planning idea at the end of World War II many research libraries substituted it because as stated by Burchard, David and Boyd (134) "the disadvantage of the separate multi-tier stack is that changing demands for reading and storage space cannot be accommodated. A solution (to this problem) lies in the erection of a building in which the building is the stack and the stack is the building and in which all possible space is free and easily adaptable to use as stack, reading and administrative area." (135) Burchard, David and Boyd admitted that the separate multi-tier stack is the most economical way of shelving books but not good for accommodating readers. (136)

Burchard, David and Boyd (137) noted that there are about six general types of locations within a building for the stacks:

1. Rear location in a "H" or "U" shaped building, as in Kansas, Cambridge University or University of Illinois.

2. Center - Columbia University.

3. Vertical - Texas, Rochester, Enoch Pratt, Caen, Saarbrucken, Hamburg (proposed), Yale, University of Mexico, Chicago, Manchester.

4. Peripheral - University of Leeds, Nebraska, Colorado, Liverpool, University College, London.

5. Dispersed in modular buildings - Wayne, Iowa, Michigan State University, Rutgers, Swiss National Library in Berne (in the stack area) and in the Library of Congress Annex.

Organization of the Book Stack

The book stacks in buildings erected in 1920 and 1930 were similar in organization. The stack columns were usually on a 3' x 4-1/2' dimension with ceiling height of 7' or 7'2" so that they would carry seven shelves of books with a 3' aisle in the clear. The length of the ranges varied from building to building, depending on the size of the stack and the opinions of the planners. A short range length was usually favored. Metcalf reported that a range of 51' was found acceptable at Harvard although he admitted that anything beyond 30' had generally been regarded as inefficient.(138)

Stack carrels or cubicles, around the outer edges of the stacks, were usually installed as part of the stack construction, that is, the stack uprights supported the carrel partitions, although sometimes these were merely pieces of furniture that could be moved.

Facilities for the transmission of books and book cards, (book carriers, pneumatic tubes, dumbwaiters, passenger and truck elevators, and stack stairways) were usually located so that they were immediately behind the central circulation desk on the main floor of the building and so that they could serve each stack level.

The question of access to the stacks, or stack control, had to be met in terms of the shape and needs of each building but the objective usually was to have a single entrance and exit point at the main circulation desk (see Butler Library, Columbia). The stacks were usually closed and were controlled by attendants at the desk. Goodrich (139) noted in 1941 that in the newer buildings the controls were moving from the stack entrance to the main door entrances, a trend that has continued since that time. Burchard, David and Boyd (140) consider a single control at the exit of the library best.

The general shape of the book stack had to be determined by the particular style and shape of the rest of the building. Librarians seemed to take it for granted that the ideal shape of the stack was a square or at least a rectangle, although variants of this have had their vogue. The Leeds University Library used a circular stack room with the ranges fanning out from the center. The stack tower idea was used in Rochester, Texas, and Yale in the United States, the University of Mexico and in several European buildings (Caen, Saarbrucken, Hamburg (proposed) and Cambridge. The horizontal stack room below the reading room was used in Chicago, Leeds and Manchester Universities.

In the early 1930's the traditional concept of the use of the book stacks for storage of books began to change in favor of one that would permit other activities to be carried out there. In the Library of Congress Annex, for instance, the stack columns were four feet eight inches in one direction and ten feet six inches in the other, and the stack ends were hung from the ceilings so that they could be removed. This permitted the use of the stacks for work rooms. In the Swiss National Library in Berne, in 1937, the stacks were free standing and the columns were in rows five feet by nine feet, thus providing some space for other functions. The ceiling heights were eight feet on some floors and seven feet on others. In the Saarbrucken University

Library the stacks were all free standing, thus permitting the use of the stacks for other functions.

In 1939, in the Colorado State College of Education Library, the stack columns were four feet six inches by nine feet to permit interchangeable use of the space.

After World War II the modular buildings went further in eliminating the inflexibility of the book stack, and, with the exception of the University of Wisconsin, almost all the newer university buildings have followed the newer practice.

The shelving of books in the American research libraries has followed the subject classification of books, regardless of size except for very large books, whereas in Europe the books fixed location principle was, and still is, used. This permits the shelving of books according to size, which results in more economical use of space.

As pressure for space grew in the United States, more attention has been given to the idea of shelving books according to size. Van Hoesen and Kilpatrick (141) found the following distribution of books according to heights, based on a representative sample:

5" x 8" or less	25 %
6" x 9" or less	29 %
7" x 10"	25 %
8" x 11"	11 %
9" x 12"	4 %
10" x 13"	3 %
over 13"	3 %

The implication of this study was that if libraries could group their books by size, more shelves per section could be used. But, as the open shelf idea became popular in the 1930's, few libraries could make use of the Van Hoesen-Kilpatrick data because of the difficulty readers would have in locating books that would be shelved in two or three separate series of numbers.

The fixed location practice is not unknown in the United States, however. In the New York Public Library (142) eight sizes were used with a 35 % gain in space. In the M. I. L. C. six sizes were used with a 100 % increase in capacity. (143)

Librarians have used a wide variety of basic dimensions and figures for calculating stack capacities. Typical examples are:

1. Growth of Collection. In 1926 Gilchrist argued (144) that the University of Chicago concept of doubling the stacks every twenty years was correct. Metcalf (145) said that research libraries grow 4 % annually. Most librarians talk in terms of the stacks doubling in size every sixteen years.

2. Stack capacities.

Observer	Per Square Foot of Floor	Per Cubic Foot	Per Running Foot of Shelving	Reference
Poole	25			146
Gerould	10			147
Githens-Wheeler	18			148
E. A. Henry	18	2-1/2	8	149
Metcalf	15	2	6	150

Observer	Per Square Foot of Floor	Per Cubic Foot	Per Running Foot of Shelving	Reference
Washington Univ.			5-6	151
Hopp	10-15	2		152
Patterson			7	153
Muller	16			154
M. I. L. C.		6-compact 1-1/2 - regular		155

The cost of storing books in regular stacks has been estimated in various ways. Eugene Power estimates sixteen to eighteen cents per volume per year. (156) Muller estimates $15.00 per square foot. (157) Rider estimates fifteen cents. (158)

Following World War II, interest in the compact storage idea was revised (it had been used in Canada and Europe earlier), and stack manufacturers began to offer special inventions (Snead and Company, Ames, Hamilton, Remington-Rand, and Art Metal in the United States and Compactus in Switzerland).

The Snead hinged swinging sections with four faces per section was the first United States compact stack, developed for the Midwest Interlibrary Center. The Art Metal compact stack is also a hinged swinging section that can be added to existing stacks, adding two faces per section. The Ames and Hamilton stacks are drawers opening into a stack aisle. The Remington-Rand concept of compact storage is that stack aisles be narrowed, the stacks increased in height, and versatility by the use of four way columns, forty-two inches center to center. The Compactus compact storage stack,

a Swiss invention, uses movable stack ranges --- twenty ranges to one aisle. A typical installation can be seen in the Stadt-University Library in Berne. Each of the twenty cases, or ranges can be moved for access to the faces by operating a lever which activities a clutch which grips a revolving cable under the floor. One aisle serves for twenty cases.

Each company claims advantages in storage capacity and savings. According to R. H. Muller, who has studied the problem extensively, (159, 160) the costs of the equipment per volume shelved are:

Hamilton	54 cents
Art Metal	56 cents
Ames	57 cents
Conventional bracket	16 cents

while the savings in space are:

Remington-Rand	increases storage	40 to 69 %
Ames	increases storage	76 to 90 %
Hamilton	increases storage	109 %
Art Metal	increases storage	53 to 73 %

His summary conclusion is that the compact storage systems give greater capacity but little economy. (161) For example:

To store 100,000 volumes in compact storage via traditional methods costs	$107,055
To store 100,000 volumes in compact storage via Hamilton	$ 97,512
Savings	$ 9,573

He concludes that a maximum savings of 25 % are possible.

> Before compact storage equipment is purchased, the crucial question to be answered is whether the materials need to be housed in the main building or not. Only if they must be housed in the main building should compact storage equipment be considered...Compact stacks don't begin to pay dividends until the building costs per square foot exceed about $27.00... the aisle reduction plan (the Remington-Rand plan) is the least expensive... available compact storage equipment of the drawer or hinge type can bring about sizeable additional economies only in fantastically expensive buildings or in situations where narrowed aisles are unacceptable. (162)

> Under certain conditions some small overall economy can now be achieved but that savings will probably not outweigh the disadvantages of semi-obstructed access to books in many situations where building expansion, aisle reduction, or conventional warehouse construction is possible. (163)

The costs of installing Swiss "Compactus" compact storage stacks in this country are not known, but in view of the simplicity and economy of the European installations it is possible they might offer a quite different cost element (opinion of Ellsworth).

Fremont Rider has proposed a somewhat different method of achieving economy in storing materials, (164) the essence of which is that libraries trim off superfluous edges of books (sizing) and thus achieve up to twenty-five per cent in storage space savings and also store books on their face edges thus increasing storage capacity savings up to sixty-five per cent. (165) Books which are sized, in the Rider plan are kept in boxes

the correct size for each book. Rider estimates that the cost of transferring a book to his kind of storage system is thirteen to fourteen cents.

A third approach to the storing of relatively little used materials has been the substitution of microphoto reproductions for the storing of the original texts. Fremont Rider offered the microcard proposal (166) in 1944 and Eugene Power of University Microfilms developed a plan for substituting microfilm positives for preserving old issues of journals. Both plans have been expanded extensively.

In evaluating the cost of converting existing printed materials to microfilm for storage in a given library (excluding the cost of cooperatively developed micropublishing projects) Pritsker and Sadler conclude: (167)

> On a cost basis, microfilm is feasible as a form of storage for large collections only if librarians are willing to accept a high reduction ratio, little or no inspection of the finished product, an image as can be obtained using a 35 mm. planetary camera and destruction of the text. If a positive film is required, the cost of (converting to) microfilm storage is prohibitive.

The cost of storing a hypothetical given collection of 1,666-2/3 linear feet of books according to three methods of filming and two methods of shelving at various costs per square foot were: (168)

	$15 per Sq. Ft.	$25 per Sq. Ft.
1. Bracket Shelving - 35'5" aisle width	$11,772	$18,436
2. Bracket Shelving - 20'7" aisle width	8,859	13,648

	$15 per Sq. Ft.	$25 per Sq. Ft.
Filming		
3. Cheapest - 16 mm. film	$ 7,518	$ 7,619
4. Regular - 35 mm. film	13,823	14,038
5. Another system	25,214	25,429

Burchard, in commenting on Rider's microcard proposal, said: (169)

> The fault with Rider's proposal is not that the inexorable laws of the geometric progression will finally catch up with it. The real difficulty is that it takes no account of the basic problem of librarianship, which is never storage, but always use.

A fourth approach to the problem of book storage has been the development of regional storage depots, which may or may not use compact storage systems.

The New England storage library in Cambridge shelved books by size for each of its member libraries. The M.I.L.C. in Chicago also shelved its books by size in Snead compact storage centers. In both cases, member libraries sent to these depots materials that were infrequently used.

Librarians have questioned the value of these storage methods on the grounds that in a research library it is difficult, if not impossible, to say which books will not be used. Universities that have built off-campus storage stacks have testified that their efforts to select "dead" books have not been entirely successful. (170)

Burchard, David and Boyd observe that some librarians hold that it is impossible to distinguish between

active and non-active books but that, in their opinion, the experience of the M.I.L.C. disproves the contention. They believe that cooperative storage is probably economical only if arrangements are made so that duplicates from members can be discarded. (171) Metcalf stated that the annual per volume costs in the New England storage library were two and one-half cents per volume. (172)

The University of Michigan, not a member of the M.I.L.C. group, erected on the North Campus in 1954 a compact storage stack, using the Ames system for 400,000 volumes at a cost of $464,000. (173)

Estimating Stack Capacities

The problem of how to calculate the book capacities of a book stack has been a difficult one because books differ so widely in size. Henderson attempted to develop a basic unit of measurement --- the cubook. He observed that Poole mentioned twenty-seven volumes per square foot; Soule and Tilton, twenty; Gerould, fifteen; Hadley, eight; Keogh, five; and that in the newer buildings the figure of ten was being used, including space for carrels, stairs, etc. (174) He defined the cubook as the volume of space required to shelve the average book in a typical library. A standard three-foot section, seven and one-half feet high contains one hundred cubooks. A million cubooks occupy 688,880 cubic feet and 91,851 square feet. Henderson developed a formula for estimating the amount of shelving that will be required for a given number of volumes, assuming that in the typical library eighty-five per cent of the books will be octavos, thirteen per cent quartos and two per cent folios. (175)

The cubook formula has not been used by library planners probably because few libraries turn out to be "typical" in terms of their requirements for carrels, stairwells and other new stack facilities. This is especially true in the modular buildings, where space for

readers and books are usually fused.

The figure of ten to fifteen volumes per square foot and two volumes per cubic foot seems to be accepted as an average figure to use where books are concentrated in a book stack where the ceiling height is seven feet six inches. It does not serve in a modular library where ceiling heights are higher and an eighth shelf is sometimes used.

Special Facilities Normally Found in Book Stacks

Open access stacks and the mechanization of libraries in recent years have led to the use of certain facilities in the book stacks.

a. Oases. Reading room space in the stacks --- commonly found in modular libraries.

b. Typing rooms.

c. Micro image reading machines. Sometimes located in the stacks and sometimes in a special room located so it can be serviced by the reference or circulation staff.

d. Research studies for faculty and graduates. Opening the book stacks to undergraduates in many research libraries has lessened the privacy of the open stack carrels and has created a demand for small study rooms that can be shut off from the noise and confusion of young students in the stacks.

e. Semi-rare books. Open shelf libraries have had to provide special housing for the type of publication that is not rare enough to put in the rare books room, but that possesses characteristics that cause it to be stolen by students. A blocked off section of the stacks near the circulation desk has been the typical answer.

The Question of Open vs. Closed Stacks

Since World War II almost all the newer American university buildings (the University of Wisconsin excepted) have provided open shelf stacks, and some of the older libraries (e. g., Northwestern) have opened theirs. The arguments for this are: The values resulting from browsing and direct contact with books. The arguments against are: Cost of keeping shelves in order; annoyance to researchers; disadvantages of reliance on classification system as guide to materials. (176) Local traditions, physical facilities and the habits of students are elements that must also be considered. (177)

Povey, librarian of the University of Liverpool, notes that: (178)

> It is said that looking in vain for a book that someone else has borrowed has a beneficial effect in introducing you to other books you may someday want to read. I submit that this procedure, if compulsory or even normal, is an uncivil waste of reader's time and a repudiation of exact scholarship.

The Housing of Non-Book Materials

With the introduction of media other than the traditional bound book as carriers for information, librarians have had to house microfilm, microprints and cards, motion picture films, slides, pictures, tapes for recordings, phonograph records, etc. Except for the assumption that film needs to be kept in a room with proper humidity control to prevent drying out, librarians know very little, if anything, about ideal housing conditions for each of these media. Special furniture is available for the housing of each and librarians use this furniture as best they can. The Universities of Purdue, Oregon, and Stanford have gone furthest in centralizing all information-bearing media in

the library, whereas in most universities it is assumed that the audio visual department is responsible for the housing and use of them.

Special Facilities that may be in the Stacks or in Other Parts of the Library

1. Carrels. Until the introduction of the modular building, carrels were almost always located around the periphery of the stacks and they were intended for graduate students and faculty. In 1913 Harvard put 300 carrels along the stack walls---sixteen feet square and seven feet tall. Each occupied one hundred twelve cubic feet as contrasted with the one hundred twenty to one hundred fifty cubic feet per reader in the reading rooms. (179)

Princeton grouped its carrels in bays (180) in double rows with a book shelf between the rows, and this practice is common in modular buildings.

Librarians have found that the typical carrel is used less than half the number of hours the library is open and have tried to increase their usefulness by assigning two people to a carrel (181) or by assigning shelves to graduate students near the carrels in the ratio of four shelves per carrel.

The use of carrels, both in the stacks and in the reading rooms, for undergraduates started in the new libraries at Princeton and Iowa. Boyd intended the undergraduate carrels to be a "base" from which the student would center his library work. These were to be private. (182) At Iowa, and in many other modular libraries, the carrels are distributed throughout the reading rooms and stacks, and they are not privately assigned.

2. Faculty Studies and Offices. As stated above, the noise and confusion resulting from open shelf stacks instituted a demand for small faculty studies. These

are sometimes located in a separate part of the library (Wisconsin and M. I. T.) close to the stacks but not in them, to increase privacy, or they may be along the stack walls. One recurring problem most librarians report is how to keep these from becoming a regular faculty office. (183) Apparently, most librarians assign the studies to faculty for a year and then shut their eyes to what goes on within them during the year.

3. Special Collection Rooms. These can take the form of separate buildings as at Harvard, Michigan, and U. C. L. A., Indiana, or special rooms in the center library at California, Princeton, and Minnesota, or a section of the combined reading room stacks as at Iowa. There are two principal functions: Protection of materials and use, or display. The two functions do not combine well (184) and consequently each rare book library provides separate facilities for the materials and for readers. The Houghton Library at Harvard and the Rare Book Room at Princeton have fully air-conditioned and fire protected rooms for protecting the books.

C. Other Facilities and Services

1. Centralized vs. Decentralized Buildings

The question of whether university libraries should be centralized or decentralized is outside the scope of this report. All research libraries on campuses are decentralized to some extent and a good many operate with a large number of departmental collections. The Universities of Colorado, Nebraska, Wayne, and Oklahoma are examples of universities that have only a small number of departmental libraries. Since the question is administrative rather than architectural or structural it will not be covered in this report.

2. Undergraduate, General Education or Lower Divisional Libraries

During the early 1930's a movement started in American universities to restore some values of the older concept of liberal education to American undergraduate education. Columbia, Minnesota, Chicago, and Colorado Universities were early pioneers in this movement and each (Minnesota excepted) provided a separate library for students working in the general education curricula. At Columbia a separate library was established in the central library. At Chicago one was established in Cobb Hall and sets of required readings were provided in the dormitories. At Colorado a lower divisional library was established in the central library with its own collection. Minnesota started one later.

Publication of the Harvard report on general education (185) in 1952 gave new impetus to the movement.

University librarians have observed that the library needs of the young students in a large university are in direct conflict with the library needs of faculty and researchers, (186) in terms of the following factors: need for access to a selected collection; need for reading quarters where they will not bother mature readers; need for the experience of developing judgment by handling books directly; and need for library staff to teach the use of books. (187) Furthermore, the ratio of number of readers per book has risen so fast at the undergraduate level that universities have found difficulties enlarging central libraries sufficiently to handle the students.

Harvard was the first university to develop the solution of a separate building for undergraduates--- the Lamont Library, (188) with a book collection of approximately 100,000 volumes and seats for three of every eight undergraduates.

The University of Michigan in 1958 followed the Harvard pattern with an undergarduate library that seats 3,000 students and houses about 100,000 volumes.

Indiana University proposes to accept this solution to the library space problems and other universities are considering it. In preparing for the predicted peak enrollments of 1970, some universities are contemplating the development of separate campuses for undergraduates, each with its own library.

As suggested by Byrd, (189) librarians have no real way of deciding whether such libraries should be located near dormitories, classroom buildings, or even whether it is better for undergraduates to do their studying in the library or in their dormitory rooms. Much depends on the question of whether the teaching methods or textbooks are inductive. (190)

Pennington at McGill thinks there are two kinds of students and need for two kinds of libraries. (191) He provided one reading room seating one hundred readers and housing 9,000 books in literature and the languages; and a second seating two hundred eighty readers and housing 32,000 volumes for the other.

Dix (192) argues that separate undergraduate libraries are not needed because students need the intellectual stimulation of an unselected collection. The closer one comes to establishing for undergraduates the library setting a researcher needs, the better.

Wagman (193) argues that in large universities with programs closely geared to research and publication, the needs of the undergraduate are frequently overlooked. He thinks a separate undergraduate library will help correct the deficiencies and, at the same time, permit the central and departmental libraries to serve the researchers. He argues that a plan of multiple study halls in dormitories won't work because

universities cannot afford to place enough books in each of them to meet the classroom needs of the students.

The University of Minnesota has established a relatively small library for freshmen and sophomores, seating two hundred seventy and housing 9,150 books, most of which are duplicated freely.

3. Nature of the Organization of Service.

As stated in the first part of this report, books and readers were intermingled in American universities until the middle of the nineteenth century, when size forced a differentiation. (194) The next step was the early Carnegie type---Carleton in 1897 and University of Oregon--with divided reading area in two parts separated by entrance and desk. Next was to put the reading rooms on the second floor and the stacks behind, Grinnell College in 1905. In 1940 the idea of relating the institutional program to the library, as proposed earlier by Princeton, was built into the Colorado Library and has influenced most university libraries since. (195)

Most university libraries prior to 1940 based their organization of service on type of material (reference, periodicals, newspapers) and in part on type of use (Reserve Book Room), with a system of departmental libraries, following European traditions.

In 1940, Colorado and Brown Universities, borrowing from several large public libraries and several divisional rooms in universities, introduced the full subject or divisional basis as a substitute for a plan based on type of materials. The reasons for this as stated by Ellsworth were: (196)

a. To bring together related literatures in a reading room.

b. To bring together all types of materials for each subject.

c. To give reference librarians a manageable span of literature control, part way between a departmental library and a universal stack.

d. To cut administrative costs of departmental libraries. (197)

e. To parallel the developing divisional organization of the liberal arts college.

At Oregon, Swank argued that by concentrating acquisition as well as reference staff into a divisional pattern, the quality of specialized bibliographic service could be improved. (198) Oregon, like Iowa, did not use the selected reading room collection concept but kept all publications in one call number sequence.

Queens College allowed each divisional library to maintain a mezzanine control room, where books are paged, somewhat similar to the Leeds University reading rooms. And they maintain a separate closed reserve room which has no connection with the divisional rooms. (199)

Wayne used a broad subject organization of materials and services, with user level recognized as a subordinate factor within the divisions. (200)

Burchard, David and Boyd noted that since knowledge tends to be growing faster between the traditional subjects than in them (201) the divisional concept would benefit the researcher who works in the new aspects of traditional subjects. They conclude that local conditions will have to decide whether it is better to make the best working conditions at the junction of the fields, or for the main trunk lines. (202)

New Mexico established an open shelf undergraduate library within an older building with 114 seats and 13,000 books arranged by subject groups in alcove type shelving. (203)

The divisional plan has been adopted by many universities based on the reasons stated above. They vary somewhat in the way they handle some type of materials (government documents) and the provisions they make for reserve books. At Iowa, the books are shelved in straight call number order (which in itself accomplishes some divisionalization) and the reference staff contains specialists in various subject areas, to whom questions are referred.

The weaknesses of the first attempts at divisionalization were: 1. the inherent ramifications of knowledge which makes labelling by divisions difficult; 2. the need for location indicators if the selected reading room concept is used; 3. the administrative costs if a complete and literal divisionalization is attempted; and 4. if a non-modular library building exists there is the problem of knowing just how much space is needed by the various divisions. These and other related problems were discussed by Smith in 1957. (204)

There is no concensus among libraries as to the virtues of the divisional plan. Wisconsin, for instance, used a variation similar to the Iowa plan. That is, all the books are in the stacks but the reference staff is divisionalized in competence. The difference between the two plans is that the Iowa stacks are open shelf and the Wisconsin stacks are closed. Wisconsin does have an open shelf undergraduate reserve room. (205)

4. Conference Rooms. Because students seem to like to study in small groups for a variety of reasons, buildings erected since World War II provide such rooms, usually adjacent to the reading rooms. The size varies from a capacity of two to fifteen. Testimony of librarians, in conversations with the author, at Michigan, Iowa, American International College, etc., indicate that demand for these rooms for group study is great. At Iowa, for instance, demand was so heavy the student library committee requested the library to start a system of scheduling the use of rooms

to prevent certain groups from monopolizing their use. Problems of noise and dating do arise. The use of glass doors and partitions is common. (206)

5. Seminars. Libraries built in the twenties and thirties (Oberlin, Michigan, Minnesota, California, Illinois) all provided a series of seminars, usually on the top floors, in which departments were allowed to gather together books used in the graduate seminars. Following the German tradition these rooms seated twelve to thirty persons around a long table. Books lined the walls.

Kilham, (207) in disucssing the planning of seminars for Princeton, covered most of the background problems and issues; he indicated that seminar rooms had been not only places where a professor held discussions with small groups, but also the places to which students came to work. Because of the difficulty of studying and talking in the same room, a new combination was set up. It consisted of two rooms called a work room and a talk room. Shelves were provided for the permanent location of reference books necessary for the particular field of study carried on therein. The next problem was the relation of the stacks to seminar space. The "diehards" having conceded a central stack, now proposed what was called, "suck-up." Books wanted in this seminar area would be withdrawn from the central stacks, or sucked-up into what would eventually be a departmental library (within the central building). The committee decided on the separation of the seminar space from the stack area - seminars above and stacks below.

A new approach to the problem, now commonly seen in the modular buildings, has been to provide seminar sized rooms adjacent to the reading room collections, the assumption being that if a book is needed while the seminar is in session it can be obtained quickly without, as was done in the older type of seminars, tying up books while seminars were in session. Actually,

librarians find, few books are used even while seminars are in session. The use comes afterwards. Why not then, argue librarians, keep the books on shelves near the seminars?

Librarians find great difficulty in keeping seminar rooms from being used for purposes other than the ones intended. For instance, the shortage of classroom space on most campuses gives the registrar an excuse for scheduling small classes in the seminars even though they are straight lectures. Small groups of students will frequently want to study in the seminars even though the room has a larger amount of space than they need. For these, and other reasons, university librarians are sometimes skeptical of the value of placing seminars in a library building.

If they must be provided, librarians are inclined to want to keep their size down to about four hundred square feet---large enough for groups of fifteen. (208) Metcalf observes (209) that, "their value is questionable. Seminars with books on the walls that are not available to others while seminars are in session have often proved wasteful."

6. Reserve Book Rooms. Reserve book rooms developed because of the need of getting out of the stacks the books that were needed frequently for course reading. One found all types and sizes---open (at Oberlin, Yale) and closed (Iowa, Illinois), books arranged on the shelves either under the course or the name of the professor (Oberlin, Yale, Michigan).

Since World War II practices have become more varied. The abundance of pocket books at low cost has eliminated the need for reserve book shelves for many books in literature---the student buys his books. Adoption of inductive teaching methods instead of the traditional methods using a combination of one text book plus outside readings (placed on reserve) has led professors to assign problems to students with the expecta-

tion that they will use the resources of the library to find the information they need. This spreads library use over a wider range of materials. Adoption of the principle of open access with careful checking at the library exit, has meant that the library could leave reserve books in their regular place and mark each book that could not be taken from the building except on a restricted basis (Colorado and Iowa), except for a small collection where excessive pressure demanded closed reserve protection.

Yale and Oberlin now place their reserve books on open shelf but enforce careful checking at the entrance of the closed reserve section. In the new undergraduate libraries the entire collections are in one sense a reserve collection (the University of Minnesota) but in the Harvard and Michigan Libraries a relatively small closed reserve section is maintained for books in short supply.

Since the reserve book function is a product of teaching methods and the supply of books, it is not surprising that there is no one standard method of handling it.

7. Processing Departments. In the European university libraries (Manchester, Leeds, Cambridge, Saarbrucken, for example) each operation in processing is usually given its own room and books are carried from room to room until placed on the stack shelves. But in the United States, most libraries simply arrange a large open space with shelves and functions so that the books tend to go through the departments on a kind of chain belt procedure. (209a) If sufficient space for all departments is not available in one open area, the division is usually divided into receiving, cataloging, serials, binding, and marking. The amount of space allotted to each is a product of number of employees and amount of material going through the department, and the degree of efficiency existing in each library.

The location of the Technical Processes, other things being equal, is close to the reference department, so as to permit frequent use of bibliographic tools that thus need not be duplicated, and of course, near the card catalog. At Wisconsin, the division is on the floor above the public catalog, and sometimes the divisions are split among two floors (Rice).

8. Staff Lounges. Practically all large libraries have facilities to take care of emergency or ordinary staff illnesses for women, but many go further and have rooms where coffee breaks can be held (typical examples, Newberry, Illinois, Rutgers, Michigan) and where staff social functions can be accommodated (Princeton and Iowa). At the University of Iowa a room twenty-seven feet by sixty feet houses a small coffee shop that is open to staff, faculty and graduate students, 10:00 to 11:00 a.m. and 3:00 to 4:00 p.m. In the new University of Michigan undergraduate library a small coffee shop exists. Most European libraries maintain canteens of this type.

In some states the coffee break is now a legal requirement (Colorado) and if a library does not provide canteen facilities within the building, they are likely to find that considerable staff time is spent going to other buildings on the campus.

9. Lecture Rooms. The original Carnegie building had lecture rooms for adult education purposes (210) and several new university libraries include them (Iowa, Lamont, Florida State, for example) for quite different reasons. Lectures, conferences, chamber music concerts, phonograph record playing, slide projection and motion picture showing are typical activities conducted in these rooms.

Librarians tend to be opposed to such rooms in libraries on the grounds that they are a nuisance and that they are irrelevant to the normal operations of a library. This is largely a matter of the point of view

of the head librarian.

10. Exhibition Areas. These are present, in one form or another, in most libraries and librarians take them for granted as devices for displaying library materials. They may be separate rooms, in the lobby, cases in corridors, or window displays, as in the Enoch Pratt Library, which has long maintained a department whose responsibility it is to make the displays a vital part of the library program.

Princeton has set aside a large area on the main floor for this purpose. Iowa uses the lobby for wall cases and free standing cases and, frequently holds receptions, with refreshments in the lobby, usually following special lectures in the Lecture Room.

Perhaps the most elaborate and ingenious display facilities in any research library are found in the Swiss National in Berne, Switzerland. Folding doors permit changing the size of the room and all the furniture has been designed so that when not in use it can be stored and so that it can be used in a variety of ways.

Libraries, like the Library of Congress, which are the center of tourist interest, devote much space to the exhibition function.

11. Audiovisual Use Rooms. Now that information is contained in media other than the printed book---the film, record, slide, and tape---research libraries must provide facilities for the use of these media. The poetry room in the Lamont undergraduate library at Harvard and a large section of the University of Michigan undergraduate library contain facilities for individual and group listening to phonograph records and tape recordings. The University of Oregon also has extensive facilities of this kind. The University of Michigan undergraduate library has a long hall, about twenty feet by one hundred feet with wall facilities for visual dis-

plays arranged by departments which want their students to study pictures as well as read about them. At Purdue the Director of Libraries is also in charge of audio-visual facilities, and the new university library is located in the new student union building, which includes extensive facilities for audio-visual storage and use.

University librarians tend not to welcome audio-visual materials or use as part of the library and, although, few will commit themselves in print, many will state privately that they think audio-visual materials do not belong in the library.

The possibility of using closed circuit television equipment in university teaching may have implications for university libraries, but as yet practically nothing is known about what this may mean.

12. Reference Departments. In the older libraries the Reference function was well established as a room in which the kinds of books listed in Mudge were shelved and used under the guidance of a reference staff. The room was also used as a general reading room---see the Universities of Michigan, Columbia, Illinois and California as examples.

But since the adoption of the subject divisional reading room idea (in the Universities of Nebraska and Colorado, for instance, the general reference room and function is practically non-existent) and the development of microfilm, the concept of the general reference room has changed to such an extent that in the Second Princeton Conference of the Cooperative Committee on Library Building Plans (211) it was agreed after extensive discussion there could no longer be a single definition of purpose, scope, or size for Reference.

In the modular buildings, where the physical structure does not force a specific limitation on any one function, one sees a wide variation of layout for refer-

ence, depending upon the conception held by the administration of each library.

13. Periodical Reading Rooms. Here, too, changes in conception parallel those for reference. The old standard pattern of a separate room for current periodicals still exists in libraries (Iowa State, Iowa, Saarbrucken, Caen, Michigan, for instance), but in others the periodicals are merged with the subject literature (Colorado and Nebraska). Ellsworth found at Iowa in a poll of faculty opinion that the faculty was evenly divided as to their desire for a single periodicals collection or a divided one. (212) The second Princeton Conference of the Cooperative Committee on Library Building Plans (213) found no agreement as to whether periodicals should be centralized, divisionalized, departmentalized or in the stacks.

14. Photo Reproduction Laboratories. In one form or another research libraries find it necessary to have in the library equipment to do various kinds of photographing work comparable to:

1. Verifax for quick, inexpensive copying for use.

2. Photostating when high quality work is necessary.

3. Microfilming for low cost reproduction.

This work can be done either in a photo laboratory or near the circulation and reference desk.

The question of whether the library shall possess the processing photo laboratory is a matter of volume of work and administrative decision. Elaborate laboratories can be found at Chicago, California, Princeton, M.I.T., Manchester as typical examples. Less elaborate laboratories are possessed by most other university libraries.

15. Browsing Rooms. Browsing rooms were very popular in American universities during the 1930's as a means of stimulating interest in reading contemporary books. Since World War II interest in them has waned because the open shelf principle in the newer libraries has lessened the need for browsing collections. Contemporary librarians are somewhat embarrassed by the vagueness of such terms as "recreational" reading and consequently have given little attention to browsing rooms.

16. Receiving Rooms. The larger libraries attempt to locate their receiving rooms so that a moving van can back into an enclosed dock for unloading (see the Midwest Interlibrary Center Building) at a dock that will be level with the truck body floor level. Mailing desk services are frequently combined with the other activities a receiving room attendant performs. Space for shelving incoming gifts is usually provided in the receiving room, or nearby, and of course the well located receiving room will be located so that incoming books can be cleaned, sorted, and moved easily into the technical processes area.

17. Binding Rooms. Most universities have given up their own binderies (exceptions: Minnesota, Newberry, and Colorado) because of the expense and delays in service. But each library must maintain a bindery preparation department in which books and journals are collected and prepared for binding and are checked in and marked when returned from the bindery. The amount of space allowed for this work depends on the volume of material to be handled and the amount of repair work that is done in the library.

18. University Archives Collections. Harvard's university archives, perhaps the most carefully arranged and organized, are kept in a section of the stacks nearby a work room for processing and use. Since it has been only in recent years that university libraries have taken seriously their responsibility for

preserving the records of their university, it is not surprising that the collections vary in size and state among universities. Ideally, the materials should be housed in quarters where the temperature and humidity are kept under proper controls, but in most universities this is not done.

19. Quarters for Central Administration. The nature, size and location of quarters for the central administration depend pretty much on the opinions of the administrators when the library was planned. Some librarians have a very humble opinion of their own importance and this dominates the thinking about their own offices. And the reverse is also true. Whenever there is an associate director of libraries, room for two secretaries, or one secretary and a typist, or two of each seems necessary. This depends, to some extent, on extra curricular activities of the librarian.

Administrators differ, too, in their conception of where their offices should be located. Some wish to be easily accessible to the front entrance, others prefer to be close to the acquisitions work of the library, others prefer to get as far as possible from the public. Librarians that rely heavily on faculty and staff committees tend to favor a conference room in the administrators suite.

IV. Structure and Materials

The problem of how to build a library, from an architectural or engineering point of view, is outside the scope of this report. Architectural and engineering elements will be considered only in so far as librarians need to know about them so that they can answer an architect's questions and so they will be able to decide whether or not their programs and plans will be expressed in a structure that will be the kind of library they had in mind.

A. Modular vs. Fixed Reading Room Multi-Tier Stack Buildings

As stated earlier, the need for greater external flexibility or adaptability and for economy, has been demanded by librarians from the middle of the nineteenth century. A. S. Macdonald developed his conception of the modular building as an answer to this demand, (214) and even earlier in 1912 Tilton had said: (215)

> A module, approximately twelve feet square will be found to produce a good relation between solids and openings. For our building of 80' x 125', there is no common denominator so we can modify the dimensions to 129' 10" x 77' 5-3/4", which will also produce 10,000 square feet, and give forty modules to the front and six to the side, 12' 10-3/4".

That there is no concensus as to the proper dimensions of the module can be seen from the sizes used:

Horizontal Dimensions	Typical Installations
19'6" x 27'	- Iowa
18' x 25'	- Princeton
18' x 18'	- Georgia, CC, New York City
18' x 21'	- Oklahoma
23' x 23'	- I.U. Southern, Illinois University
25' x 25'	- Kent State
21'8" x 21'8"	- Washington University

22'6" x 22'6"	- Idaho, Santa Barbara
19'10" x 21'	- Western Reserve
18' x 22-1/2'	- Bradley
21' x 27'	- Cincinnati, P. L.
27'	- V. P. I.
22'6" x 34'	- Western State College, Michigan
17'4" x 23'9"	- Wayne
18' x 27'	- Wayne (in Kresge)
22'8" x 22'8"	- Brooklyn

Vertical Dimensions - Ceiling Heights in Clear	Typical Installations
8'	- Iowa, Oklahoma State
8'1"	- Western Reserve
8'2"	- Georgia
8'6"	- Princeton,
8'11-1/4"	- Southern Illinois
9'	- Bradley, Brooklyn
9'2"	- Oklahoma State (on some floors)
9'6"	- Kent State, Santa Barbara

Vertical Dimensions - Ceiling Heights in Clear	Typical Installations
10'	- Idaho
19'6"	- V.P.I.
14'	- Brooklyn (first floor only)

The reasons given for these dimensions are:

Iowa: 19'6" x 27' - gives right aisle width for stacks and one module in right size for seminar, one-half right for conference and one-sixth for faculty study. (216)

Princeton: "Naturally, the size of this room (the 'talk' room), approximately 18' x 25' was a factor in determining the bay size for modular space. It equalled four stacks in width and permitted sections of book stacks in multiples of three feet either way. Half a bay, or nine feet would give a typical office." (217)

To determine ceiling heights Princeton built an experimental module and tried various heights on a meeting of the Cooperative Committee on Library Building Plans. (218) They liked 8'6" best. Author was present.

Macdonald: "The term modular applies to a method and not to any particular dimension either horizontal or vertical." (219)

The controlling factor is the size of the building site. (220)

Basic dimensions are the three foot shelf length and four and one-half foot aisle dimensions from stack column to stack column - 18' x 27' are multiples of these dimensions, and so is 22-1/2'.

Macdonald says 27' x 27' is best but according to Gilbert Fish, in 1945, 22-1/2' is most economical to manufacture with "dry" steel. Ceiling height can be as low as eight feet, but 8-1/2' and 9' are more popular. (221)

Kirchoff: Says the basic dimension is 4'6" x 9'. (222)

Hutchson: Says "this can be achieved by adhering to a relatively simple and regular plan form in which the dimensions of the unit structural panel are approximately multiples of the library furniture to be used. Such an arrangement may be reduced to a modular plan form." (223)

Metcalf: Thinks table and aisle dimensions should determine size of module and that there should be different sized modules for different functions in the larger buildings. (224)

Ellsworth: Started with basic dimensions:

Stack range length - units of 3' x 4' for range ends.

Table widths - 43"

Table lengths - 6', 9' and 12' best

Distance between tables - 5'

Distance from table to stack faces - 6'

Stack centers - 4-1/2'

From these data he deduced that the smallest practical reading room would appear to be 24'2" from edge to column, based on the following calculations:

6'	from edge of stack to first table
43"	table width
5'	between tables (two tables assumed)
6'	from edge of table to edge of stack
24'2"	plus 18" for column, or 25'8" between column centers.

But it is necessary to assume that the same space will some day be used for book storage. If the stacks were spaced on 4-1/2' centers, five ranges take 22-1/2' and six take 27'.

Thus, it would appear that in the interest of economy of floor space utilization it would be best to use a column of 27' between centers along one of the sides of a module, and when the space is used for reading room purposes, spread out the tables slightly more than is necessary. The dimensions of the other side of the module should be in units of three feet and should be no less than eighteen feet if seminars are to be used. (225)

The arguments against the structural advantages of modular planning are that improvement in lighting and air control may some day limit the flexibility of existing modular buildings, (226) and that in large libraries flexibility is provided at extra cost for two-thirds of the book stack space which will never be moved. (227)

Also, when floor as thick as five feet is used, the vertical dimensions become such that the traditional two stack floors for one reading room floor would be better. (228)

B. Floor Loads.

In pre-modular buildings, reading room areas were not designed to carry concentrated ranges of book stacks and were not therefore usually built strong enough to support them. The Wisconsin building codes require reading room floors to support fifty pounds per square foot in the reading room, eighty pounds in stairways and corridors and one hundred pounds in the stacks.(229) The Wisconsin code loads for reading rooms would be unacceptable elsewhere because experience shows that sooner or later librarians will place book stacks in reading rooms. Tilton in 1912 used the figure of one hundred twenty-five pounds per square foot in the stacks. (230) Macdonald figured one hundred five pounds per square foot. (231) At M. I. T. two hundred twenty-five pounds were used for first and second floors and one hundred pounds on third floor. (232) Rutgers designed a sixteen inch floor slab with a live load of two hundred fifty pounds. (233) Iowa used one hundred fifty pounds live load on all floors. (234) Antioch College used one hundred sixty-five pounds. (235)

In the pre-modular buildings, the methods used in book stack floor construction were standardized with each manufacturer---all about four inches thick. But in the modular buildings, the methods and floor thicknesses differ radically, depending on many factors---the size of the module, type of materials and construction, nature and extent of ventilation and lighting system. Existing buildings vary from 12" to 3-1/2".

Macdonald's original conception was a type of structure that with 22-1/2' between columns center would permit a floor thickness of not over twelve inches. (The North Dakota State College Library came close to this.) But he had contemplated using a system of rapid circulation of air requiring small ducts and he had not contemplated a Louverall type of lighting fixture, which requires considerable space between the fluorescent tubes and the ceiling lens or baffles.

In fact, in the various sessions of the A. C. R. L. Building Institutes, Ellsworth, Kirchoff, and Macdonald have warned that floor thicknesses over 16" to 18" lessen considerably the value of the modular method, and that better results would be achieved by raising ceiling heights slightly and going back to the older two stack floors to reading room floor idea. (236)

The added cost of strengthening all floor areas so as to accommodate book storage was estimated by Burchard (237) as one per cent of the cost of the total building. At Iowa the architects estimated that the extra cost was so small it was a negligible amount. (238)

In several European libraries, special types of stack floor construction (Leeds in England, Caen in France, and Saarbrucken in Germany) permit an even thinner floor than has been used in the United States.

C. Library Lighting.

Less than a century ago all library lighting came from the sun through windows except for candle and oil lamps. Thus it is interesting to hear Mr. Basset Jones, an expert in the field of illumination say: (239)

> The window is the worst and most costly lighting devise ever invented by man. It does everything wrong, and furthermore, it costs more to make the hole for the window than it does to build the wall in place of the hole...the less windows you have the better. Use them for psychological reasons. Make them peep holes if you like so people can look out. Don't try to mix daylight and artificial light.

Quantity of Light for Reading Rooms.

That there is a wide difference of opinion on the question of how much light is needed for reading can be

demonstrated from the amount of foot candles provided in the following sample of new buildings:

Library	Foot Candles Provided for Readers
Alberta	50
Georgia	58 to 60
Harvard - Lamont	18 to 20
Iowa	35
Kent State	100
West Michigan College	40
Oklahoma State	75
Santa Barbara	50
Skidmore	35
V. P. I.	60
Wayne	30 to 50

One reason for such wide divergence of opinion is that experts know that it is the quality of light not just the quantity that makes for comfort. Dr. Gertrude Rand, for instance, said that twenty foot candles is right for libraries, but says that light levels are secondary in importance to the brightness distribution and the diffusion of light. Advises the use of light colored tables, furniture and walls...as light levels increase, the ability of the eye to adjust to contrasts decreases. (240)

Logan says that (241) the quantity of light needed depends on specific need and degree of contrast within the area seen by the eye. One cannot determine these by asking people's opinion as the Harvard study did. (242) Logan gives a list of desirable light levels for library areas:

Book order offices	30
Catalog department	30
Conference rooms	10
Carrels	30
Documents	50

Exhibitions	30
Map room	50
Periodicals room	50
Reading room	50
Reference room	50
Work room	50

He comments:

> There is now a rational scientific basis for the prescription of illuminating levels; second, that the economic introduction of "quality" in lighting is dependent upon the extent to which the light that is introduced in an interior is controlled first at the source and they by the engineering selection of the appropriate reflection factors at every source it strikes; third, that the economic design of lighting systems for work environments has progressed far beyond the point where a layman can be justified in selecting fixtures on the basis of his lay knowledge. He requires the assistance of trained engineers.

Logan has designed a flux distribution curve to determine the degrees of brightness necessary in a given place.

Walker (243) mentions the elements that are necessary to reduce the amount of adjustment the eye must make:

1. Color (contrast)

   Ceilings - pure white
   Wall surfaces - reflections of at least 0.50 munsell value 7.80 and chromes not exceeding 4.
   Floors - reflections of at least 0.30 Munsell value 6.

Desk tops - reflections of at least 0.30 Munsell value 6
Furniture - same as desk tops
Venetian blinds - white
Average illumination - 20 foot candles. 20 lumens per square foot.
Maximum brightness of a luminaire should not exceed three times the brightness of paper.

2. Systems

a. General (Louverall); b. angle - indirect; c. localized - combination of spot and general; and d. local - spot.

He also lists the adequate lumens per square foot for library areas:

	Lumens per Square Foot
Reading room - general	7
Reading room - on books	15
Book room (stacks)	7
On backs of books	2
On walls	15

Engleken lists four types of light systems (244) which are the same as those mentioned by Walker.

In some of the modular buildings in the United States use has been made of the Louverall (Walker type I) system (North Dakota State, Idaho, and Southern Illinois) in which the entire ceiling becomes a light source through which light from fluorescent tubes suspended above passes. The fixture can be either the egg crate type or some kind of glass or plastic sheet.

In the Swiss National in Berne, Switzerland, the lighting system over the card catalog and exhibition area is of the Louverall type, the light source being

either the sun or fluorescent bulbs. (245)

In the Viipuri, Finland, Library (246) Aalto used a unique system that gives diffused indirect lighting. No direct rays of sun enter the rooms. Prisms spread the light evenly, with no shadows. At night light fixtures imbedded in the ceiling holes supply the light source.

D. Special Lighting Situations

1. Library Stacks

Kaplan says that if incandescent fixtures are used, they should be spaced at four and one-half feet intervals instead of at the traditional six feet intervals, along the aisles. (247)

Chester Lewis (248) said that twenty to thirty foot candles are more than adequate for the stacks. The high initial cost of fluorescent lights is offset when long hours of use are involved. He used filament lights in long ducts that move in the ducts. The lamps can be rotated so as to avoid glare. Four lamps in a row forty-four feet long; two lamps in a twelve foot row and one lamp in a nine foot row. The disadvantages of this arise when more than one reader is in a row and when the reader burns his hands on the lamps.

Reputable stack manufacturers have developed stack lighting systems that give adequate light with multiple control switches at ends of ranges. Automatic shutoff switches as seen in the Library of Congress Annex are available for stacks when the number of users in each range is not large.

2. Stack Carrels

Ordinarily are lighted by spot or desk lamps. Kaplan (249) warns that carrels should not be lit by general overhead lighting because of the shadows that will be

cast on the table surface.

3. Reading Room Tables

In the older libraries with high ceilings it was impossible without spoiling the appearance of the room, to design a light fixture that would provide adequate light at the table level. Consequently, these libraries (for example, Duke, University of Michigan, University of Chicago) provided supplementary lamps attached to the tables.

In the newer modular libraries, light fixtures which are part of the ceiling, eliminate the need for table lamps.

No library ever designed a table lamp that satisfied the users. Perhaps the closest was the design of Bassett Jones. (250)

Although the problem is now largely an academic one, examples of high ceiling table lights by means of spot lights in the ceiling can be seen at Harvard, Widner, and Columbia University.

4. Fluorescent vs. Incandescent

Since the Chicago World's Fair in the 1930's the use of fluorescent fixtures has grown. The University of Colorado Library was the first large library to use a complete installation (1939). The literature is full of claims and counter claims for each type of lighting and 99 % of these aren't worthy of mere citation. The question of whether in a given case fluorescent or incandescent fixtures should be used can be settled properly only by an illumination expert. He will decide on the basis of long term costs, results desired, and the peculiar problems presented by the building in question.

In the meanwhile, Anthony Thompson, an English

librarian, summed up the situation by saying that, "shielded diffused fluorescent lighting seems now to be winning the field." (251)

E. Library Ventilation

Elements

Humidity, rate of change of air, clearing factors, cost, temperature.

1. Temperature and Humidity

Librarians and architects think that people and books have identical temperature and humidity needs. (252) At M.I.T., winter reading room temperatures are set at seventy degrees and summer maximum, eighty-five degrees with humidity at fifty per cent. (253) In the Harvard Rare Book Library, temperature is maintained at seventy degrees and humidity at fifty per cent. (254) Randall says (255) temperature should vary from seventy to seventy-five degrees and humidity, forty-five to fifty-five per cent. (256) Burchard, David and Boyd mention a humidity ratio of forty to fifty per cent. (257) In the Rare Book Room at Princeton a humidity rate of thirty-five per cent in cold weather was maintained. (258)

Burchard, David and Boyd summarize the existing state of knowledge about temperature and humidity as follows: (259) There is a connection between the life of books and manuscripts and the atmospheric conditions under which they were kept (page 65). Sometimes changes in condition cause rapid deterioration. Too high temperatures usually mean too dry air. Extremes in humidity cause known damage---make paper and glue brittle. Too moist air reduces tensile strength of glue. Also causes damage through chemical changes, i.e., chlorides are converted into hydrochloric acids. Moist paper absorbs other impurities in the air and also aids growth of bacteria.

An air cooled library presents a psychological problem for people entering a cooled building from outside temperatures that are high. Since it is known that people differ in their ability to adjust to quick changes of temperature, it is not surprising that some suffer considerable discomfort. Whether or not this change can cause physiological damage is not certain.

It is said that there never should be more than a fifteen degree difference between exterior and interior temperatures, so that the shock of adaptation will be minimal. If it were possible to introduce a person gradually to lower temperatures upon entering, or higher upon leaving, this concept would be useful. But no library can do this.

2. Turnover of Air

The Wisconsin State building codes call for a circulation of not less than thirty cubic feet of air per minute per person. Not less than ten cubic feet of air per minute must come from outside, properly filtered. (260)

Burchard, David and Boyd say that air motion is necessary for human comfort. Normal velocity range should be between fifteen and twenty cubic feet per minute. They say that little is known about effect on books but think mildew occurs in stagnant air conditions. (261)

Campbell and Goodwin say there should be a complete air change every five to seven minutes. (262)

3. Air Cleaning Methods

The Houghton Rare Books Library at Harvard used a triple process of washing, filtering plus an electric precipitation method. (263)

Beach reports that at the Union Theological Library

they followed the Bureau of Standards 1932 report, which showed that, "the principal factor in deterioration of books was sulphur dioxide, which in concentration about a tenth part in a million increases the 'copper number or measure of damage to cellulose in paper.'" (264) Union used pre-filters to catch bulky dirt and high quality resistence filters (thick to medium) to remove dirt and soot and a separate spray system to remove sulphur dioxide from the stacks. (265)

Burchard, David and Boyd comment on methods of treating the following pollution problems: Dust---can be eliminated by washing the air, filters and precipitation. (266) There are several types of filter on the market. Oil (the University of Cincinnati, a typical installation) is costly to install but maintenance cost is low. The electric static dust preceptron is efficient but costly and requires high voltage. Little is known about the potential effects of bacteria on books, or how to kill them except with sterilization lamps in the air ducts. Likewise, little is known about how to kill odors, such as arise from tobacco smoke. (267) They suggest that certain areas in which a separate high turnover of air circulation system is installed be set aside for smoking, but they admit this will not make smokers happy for the simple reason they do not want to leave their work to smoke. (268)

4. Zone Controls and Special Systems

Ideally, each reader should be able to adjust the system near him to suit his own needs, but no library has been able to do this. Each building is usually zoned into areas that have needs that can be met with a set temperature and humidity ratio.

> The usual equipment for all year air-conditioning consists of heating and cooling coils placed before and after an air washer, which are individually controlled by thermostats and humidostats. (269)

The actual distribution is done through ducts to jets, diffusers and grills or registers. Each has its own advantages and disadvantages.

A. S. Macdonald's first conception was that the columns which support the structure would carry the air into horizontal beams, from which it would enter the room through diffusers. This has been used at Hardin-Simmons, North Dakota State and Georgia. Engineers (270) have raised the question of possible fire hazards and the advisability of high velocity air flow, but these problems seem not to have arisen where this system is used.

In the Viipuri Library in Finland an ingenious system of glazed earthenware and cast iron ducts in the outer walls of the building, (271) with panel heating in the ceiling offers a unique system well adapted to that climate.

Gates proposed the use of Triethglene glycol for air-conditioning in 1945, (272) but this system was never perfected to the point of practicality.

F. Acoustical Levels

Librarians have always assumed that libraries should be quiet places in which to work; but they differ in terms of what they mean by quiet. Mr. E. A. Content says that there is a concensus that the amount of noise in a reading room should not exceed thirty decibels, or about the noise level of a "quiet residence." (273)

The usual acoustical devices are used in libraries to achieve whatever level the planners request.

G. Exits - Code Requirements

Codes are not uniform throughout the United States. The Wisconsin code may be taken as a typical conser-

vative set of provisions. It calls for two exits per floor for a two story building, with stairways of at least three feet eight inches wide, risers of not more than seven and three-fourths inches height and treads not less than nine and one-half inches deep. Larger buildings require more stairways, or wider ones to provide a total exit width of at least thirty inches per one hundred persons in fire resistant buildings, and forty inches per one hundred persons in non-fire resistant structures. All must have exit doors three feet four inches wide that swing outward and that are operable by bar---not by key. (274)

H. Toilets

The Wisconsin codes call for one water closet per sixty males; one urinal per thirty males; one water closet for thirty females; one water closet for twenty employees; one urinal for each forty male employees. (275)

I. Elevators

Librarians, have in recent years, wanted to try escalators instead of elevators but always they have found as Walker stated (276) that they are very expensive in first cost and maintenance as compared with elevators.

Larsen said in 1931 (277) for a library of 500,000 volumes one elevator four feet by four feet six inches--live load of 1,000 pounds, 100 feet per minute is satisfactory. Also one book lift two feet six inches by two feet three inches and three feet high with three removable shelves, carrying a weight of two hundred pounds at seventy-five feet per minute is satisfactory.

J. Floor Covering

Since the development of plastic materials there has been no authoritative evaluation of the relative merits

of floor cover types. Kirchoff made a survey of actual installations after World War II and concluded the rubber tile was the best. (278) Kilham points out that the New York Public Library has used cork successfully for forty years (279) and thinks maple laid in mastic over concrete is satisfactory because he knows of examples where it has lasted sixty to eighty years in public school buildings. Thompson (280) evaluates the various types as follows:

Wood	- good in all respects
Cork	- good but expensive and doesn't wear well
Plastics	- slippery, cold and noisy
Terrazzo	- cracks, is cold, hard and noisy
Linoleum	- recommended
Rubber	- one of the best

Hobbie (281) mentions that in the new American International College asphalt tile on cement is hard on feet of users and dents badly.

The comment is frequently made that rubber tile floor covering is less hard on the feet of users than are other covers. There is such close agreement on this point that one hesitates to question testimony, but on the other hand this may be just a matter of old wives' tales.

Kaplan comments that architects and librarians agree that rubber tile is best. (282) This statement is probably based on a survey made by Kirchoff of existing installations in 1955 and reported to the Cooperative Committee on Library Building Plans.

No real comparative analysis of floor coverings has been made since the development of the plastic impregnated materials. Until this is done the testimony of experience is the most satisfactory guide to the older types.

K. Fire Protection

Since water from the sprinklers would probably cause more damage than the fire it was intended to extinguish, fire protection measures in libraries have taken the form of fireproof structures (see the Newberry Library as an example of an older building that is almost completely fireproof--even the roof), portable fire extinguishers, and elimination of smoking or other controllable causes of fires. Princeton University used, for its rare book area a system of carbon dioxide (283) sprayers. The chemical is stored in tanks outside the area and is connected to it by tubes and nozzles, which would release the gas and kill the fire if activated.

The zoning of buildings with fireproof doors and walls, so as to protect occupants and prevent a fire from spreading is generally practiced in most libraries.

Thus far no modular library has ever had a major fire outbreak and consequently nothing is known about what would happen in them. In theory, the air circulation system would be shut off, if a fire broke out, thus preventing the spread of the fire or damage to structural elements except those near the fire. In an all steel building with no protective coating on the columns and beams, the situation would be the same as it is now in a multi-tier stack.

V. The Development of the Technology of Building

Modern libraries, like Manhattan Island skyscrapers, are mechanisms that require skilled engineers to operate them; and although there have been many new developments in the last twenty years there is reason to think that the important developments are ahead, not behind. (284)

The man who has, without doubt, contributed most

to library building technology is Angus Snead Macdonald. In addition to the many innovations he made in multi-tier stack construction (steel decks, bar shelves, suspended uprights, etc.) he was the first to come forward with a compact storage system in the United States. His articles, with Alfred Morton Githens, on the library of the future in 1934 was the water shed between the old and the new, for it led to the development of what is now called the modular building.

His understanding of the problem of library buildings is illustrated by the following statement: (285)

> Of this we can be reasonably certain: The design of the library of the future will be dominated by engineering and scientific considerations rather than by the desire for a fine architectural effect as has so often been the case in the past.

The new buildings have rid themselves of the monumentality of the old architectures, but their planners have not yet been able to make full use of the new light weight metals, nor has the problem of ventilation been solved. Structure and function are treated as though they were two unrelated elements. Internal flexibility is greatly improved but the moving of partitions is still a costly process and there are no really satisfactory examples of air supply systems for areas that are subdivided properly for library use. No library has as yet dared use a thin prefabricated skin that could be easily removed to permit expansion (except the University of Iowa which did so on three sides of the building, using Robertson insulated Q panels, which are not too well designed for that purpose).

Present day buildings meet most of the needs librarians have requested during the last century, but they are not as good as present day architects and librarians want them to be.

IV. Aesthetics--- Styles, Fads and Fashions

That man expects a library to look like a library although he is never sure that he knows what a library should look like can be ascertained from the fact that when a new architectural treatment is offered the screams rise higher than the campus towers!

It may be that, without anyone realizing it at the time, each period style of libraries is a perfect expression of that period's attitude toward the idea of a library---or toward knowledge. Certainly one could argue that there is a consistency between the instrumentalism of the 1950's and the functionalism of modular libraries, just as it could be argued that the Gothic Library (Temple or Northwestern or Yale) expressed the reverence toward knowledge Americans had in the 1920's.

Poole in the 1880's was already objecting to the high ceilings of his time, to the "solid blocks of vacuity...hard to heat, hard to light and hard to operate." He also objected to the fire trap dangers in the Victorian libraries, as well as to the fact they were costly and hard to enlarge. (286) And in 1936, speaking of the Temple University Library, Mr. E. J. Carter said, (287)

> This is Gothic gone mad! With light relief provided by an "attractively designed aquarium and rock garden" in the Reserve Book Room to "secure a bit of variation and break the flat effect of so many tables and chairs." Well, Well! After one had dodged the aquarium and wrenched one's distracted attention from the Olde English Roofs and decoration, one finds a carefully planned library with a capacity of 250,000 volumes and efficient modern equipment, except whereas, as perhaps in the lighting, Gothic principles do not conflict with modern practices. In such cases, the

Gothic wins hands down. The stack has carrels.

And, to complete the cycle, A. S. Macdonald says of the modular style, (288)

> ...compact, adaptable and expandible. But on the other hand, it is likely to be aesthetically dry and uninteresting, unless the architect devotes his inspiration toward perfecting color, texture, equipment, and the physical opportunity.

R. B. O'Connor, the most articulate of contemporary architects on aesthetics of library buildings, says, (289)

> The Carnegie Libraries anticipated much in the expanding philosophy of library use, but their physical form was still an expression of a classicism that was, in fact, already dead. We are beginning, at last, after half a century, to bring form and function, ideal and practicality into a new, if still tentative, harmony which is as important in the development of that evolving culture as it is exciting, and withal, promising, for the future of the library and of architecture.
>
> Flexibility is the prime characteristic of modern library design, as it is of most present day buildings. (290)
>
> The same mode of thought which in mathematics led to relativity finds expression in the architectural element of a promise of freedom within controlled but not confined space and areas and perspectives which change endlessly with the position and movements of the observer ---as in Deschamp's Nude descending the staircase.

> Cubism and its various offshoots were conscious attempts to apply to art the principle newly established in mathematics and physics. (291)

> A further similarity between the contemporary approach to scientific problems and those of architecture may be noted in the use of color as an independent element in design. Color has of course been inherent in artistic productions since the dawn of history as an integral part of representation as well as non-representational art. With the advent of cubistic art in the twentieth century, however, color began to be used quite differently from any previous era---abstractly, as one of the several elements which compose visual experience comparable with the line, the plane, the solid, the texture. Thus in the paintings of Picasso or even more directly in those of Mondrian we find studies in the use of color solely for its emotional content totally divorced from any naturalistic association. This closely follows the methods of science where the aim is precisely that of isolating and studying the component elements of a substance or problem as a thing of and by itself through the elimination of any unrelated factor.
>
> The result in architecture has been in recent years the very much greater use and vividness of color in the first place, and in the second, the detachment of color from the mere enchantment of traditional form. (292)

O'Connor says, however, that it would be misleading to say that the (293)

> theoretical components of contemporary architectural design are the sole or even controlling factors in our present day buildings.

In the United States the element of practicality has always been a major factor. Our libraries must function as librarians want them to.

Creese, in commenting on the rôle of local influence on the University of Louisville says that the following qualities give that library its unique American flavor: (294)

1. Borrowing the modular system from the American skyscraper or factory.

2. Supermarket method of collecting books from open shelves.

3. Windows through which to look at the beautiful campus. European universities don't have beautiful campuses to look at.

4. Mechanical ventilation and lighting.

5. The contrast between the amplitude of space and the working and effort to keep labor and construction and operation at an absolute minimum.

And Murphy and Mackay in planning the Washington University Library in St. Louis said: (295)

> The new library... should belong to the landscape. In spite of its required bulk, it should not dominate. It should be a good neighbor to the existing buildings---neither flaunting its new architecture, nor copying the old. It should recall the textures and materials of the old buildings, and with them create a new composition that would preserve the present feeling of the campus.

Githens stated the problem thusly: (296)

> The practical lessons to be learned from all

> these new dicta (function!) are that a library building is a shell enclosing a highly specialized organism, and that the shell must fit the organism.

Jast, in writing about the monumental American libraries built before the modern period said: (297)

> And this brings me to my principal criticism of many of the recent library buildings in America: The architecture and the decorations shout down the books. You go into one of these buildings ---say the splendid new building in Detroit--- and you are struck by the generosity of the planning, and the beauty of the detail...and then...your eye lights on some books and you say: "Why, bless me. It's a library!"

Libraries today glorify the book and the use of books.

Part B

Evaluation of Evidence

Introduction (References 1-8)

As near as one can tell, the histories of libraries seem not to be based on source material, but rather on secondary sources, and upon the buildings that now exist.

Objectives of Planners (References 9-50)

Since men seem to develop their ideas of what libraries should be and do out of their judgment, experience and imagination, they seldom bother to state the nature of the evidence they use in making up their minds. The general objectives of libraries---stated in Poole's ten points in 1887 (Ref. 11)---seem to apply equally well today. The specific objectives of a particular building will be dependent on time and place.

9. No evidence.
10. No evidence.
11. No evidence.
12. No evidence.
13. No evidence.
14. No evidence.
15. No evidence, except experience.
16. No evidence, except experience.
17. Cites experience of specific buildings.
18. No evidence.
19. Statement of fact widely known.
20. Based on his experience at Johns Hopkins.
21.
22. Based on specific experiences at Princeton.

23. Developed by Library Committee as statement of intent.
25. Example of new concept.
27. Example of new concept.
28. Examples.
29. Examples.
29a. Example of specific application.
30. Example of specific application.
31. No evidence, except the specific experience gained in planning one library.
32. No evidence.
33. Statement of fact.
37. No evidence.
38. No evidence.
40. No evidence.
41. No evidence.
42. Statement of fact.
43. Statement of intent.
44. Statement of intent.
45-50. No evidence.

Planning Principles, Methods and Procedures (References 51-70)

Evidence in this section consists largely of statements of individual experience based on work with buildings.

Contemporary Planning (References 71-76)

The evidence given in this section documents the new planning methods that grew out of the work of the Cooperative Committee on Library Building Plans. The validity of this method can be determined from the success of the buildings planned during this period.

The evidence consists of testimony as to the advantages in using a consultant, based in each case on known experience.

Formal Group Criticism of Plans (Reference 81)

Here the evidence consists of descriptions of this method.

Proper Use of Librarian in Planning (References 82-98)

Evidence consists largely of testimony to the effect that in early planning librarians had no voice and statements of what the librarians should be permitted to do.

Role of Boards and Building Committees (References 99-103)

Although the literature says much about what boards and committees should do, it is completely silent on what they actually do. One possible explanation for this is that librarians don't want to tell the stupid things boards sometimes do.

Architectural Competitions (References 100-103)

Since little use is made of architectural competition for libraries in the United States, it is not surprising that the literature has little to say about them. Githens sums up what architects think of them.

Factors that Determine the Planning Method and Concept of Design (References 104-108)

Historical evidence for the conclusion that when function predominates, the librarian's advice is sought; otherwise not. The problem is one of aesthetical values and hence hard to evaluate.

New Methods and Techniques

1. "Scientific" Planning (References 109-110)

There is a large and growing body of literature describing methods of determining amounts of space

needed and layout of functions on the basis of job analysis, preparation of flow charts and quantification of results. The methods work very well when the problem is relatively simple and specific.

2. Modular Planning (Reference 111)

This is an example of a new concept entering the field. The literature consists first of reasons why the method is needed, description of the method, examples of application and finally generalizations based on experience.

Since the implications of the method are too new to be well understood, the best evidence will be the statements of program.

The Factor of Obsolescence (References 112-114)

Librarians know pretty well, on the basis of experience what the factors are that cause obsolescence:

1. Growth of collections
2. Increased need for reader space
3. Introduction of new functions that cannot be accommodated
4. Poor planning that causes blocks
5. Buildings that wear out

and when they discuss these they are clear. But when it comes to discussing methods of minimizing the factor of obsolescence they are still in the stage of debating the issue and this determines the nature of the literature.

How Libraries Have Housed Functions

1. Space for Readers (References 115-131)

Librarians know a good deal about retrospective hnadling of the problem, but nothing about what ideal conditions should be.

Space for Books: At any one time librarians are able to determine amount of space needed for book growth, in terms of past experience, but they cannot predict what the future will bring.

Generalizations by Rider and Metcalf are no doubt true in terms of what we have known, but they do not tell us what the size of our libraries will be when the Near, Middle and the Far East have become industrialized.

Our understanding of the problems of housing the book is pretty good. Our methods will be determined by our desires and our pocketbooks. For instance, we won't use Fremont Rider's suggestions or European fixed location methods unless we are forced to do so for reasons of economy.

2. Organization of the Book Stacks
(References 138-140)

Our information on this problem is adequate.

Shelving of books: Same as for previous problem.

Growth of Collections: See previous discussion.

Question of Open vs. Closed Stacks: Our understanding of this question is very poor. We have little evidence to justify what we do. Emotional considerations govern our choices.

Housing of Non-book Materials

Carrels: We know enough to know that carrels are needed, and that they are not used many hours per day. We cannot decide whether or not this is wasteful.

Faculty Studies: Our knowledge is adequate.

Special Collections Rooms: Our knowledge is adequate.

Centralized vs. Decentralized Buildings

Because the question is usually solved on the basis of what faculty think they need and want, as well as by financial and geographic conditions, rather than on real needs, the question of the quality of our evidence is not relevant. For instance, on the basis of our analysis of the problem, logic would suggest that there should be more centralization and less decentralization. But logic does not control the situation.

The introduction of closed circuit TV, and other forms of facsimile transmission, as well as the new rapid copying devices, as well as increased emphasis on interdepartmental research in new areas may change the situation.

Undergraduate Libraries (References 185-193)

Evidence is pretty clear that in the large universities with an undergraduate population with mixed backgrounds, a single library building is not satisfactory.

As one way of solving this problem, the separate undergraduate library is a promising experiment. They are too new to be evaluated properly. Evidence gathered from Harvard and Michigan suggests that students like them and that they relieve pressure on the central library.

Nature of Organization of Space

Librarians have no convincing evidence that any one pattern of organization is better than any other. The literature is full of assertions but not proof.

Conference Rooms: Available knowledge sufficient.

Seminars: Available knowledge sufficient.

Reserve Book Rooms: Available knowledge sufficient.

Processing Department: The new "scientific" method

of space planning is sufficient to enable librarians to do good planning.

Lecture Rooms: Librarians debate the need for these rooms on an emotional basis. The problem is really one of choice of program. Architects know how to design them properly.

A-V Rooms: Librarians are uncertain as to whether they want these in libraries. Michigan and Harvard, and others, have done a careful job of selecting and installing equipment.

Reference Rooms: Librarians take them for granted, but have no real knowledge of what is done in them, or how they should be organized.

Periodical Rooms: Available knowledge is adequate.

Photo-duplication Laboratories: Available knowledge is adequate.

Browsing Rooms: Available knowledge is adequate.

Receiving Rooms: Available knowledge is adequate.

Binding Rooms: Available knowledge is adequate.

Archives Rooms: Available knowledge is adequate.

Administrative Offices: Available knowledge is adequate.

Structure and Materials

World War II put an end to the designing of libraries as works of art. The last prewar building---the University of Colorado---used a consistent two to one basis. Modular construction has been used almost exclusively since that time.

We have enough knowledge available to plan nearly perfect fixed function libraries using the two to one basis for determining vertical dimensions. The reason more fixed function buildings are not being built is that librarians know that they do not know how to determine the size of various parts of the building to meet future needs. Hence, modular planning.

Modular vs. Fixed Function Buildings

Our available knowledge is such that we know when to use the modular method, but we do not know, in every case, whether to use it for all, or for part of a building.

Librarians know how to plan the layout of the fixed functions in a modular building. Architects do not know how to solve the ventilation and light control problems in a modular building, nor have they learned how to achieve economy of construction. On the other hand, they know enough to do buildings that work very well.

Library Lighting

Available information is satisfactory. Logan's research (Reference 241) is satisfactory.

Ventilation

It is clear that almost nothing is known about proper ventilation except that certain temperature ranges are comfortable, that people and books need a humidity level somewhere between 35-45 degrees, and that movement of air is necessary for comfort.

We know how to clean air and to take out the impurities that cause damage to books.

Acoustical Levels (Reference 273)

Existing knowledge is satisfactory. Failures result from the inability of librarians to tell architects the noise levels that should exist in a given area.

Floor Coverings (References 278-280)

Available knowledge is not sufficient to cover this problem now that plastics are available. We know that rubber tile was best prior to the use of plastics, but we have no real basis for a decision now.

The Technology of Building

Librarians know nothing about this, nor should they.

Codes

Librarians know enough to know that chaos exists.

Aesthetics

We seem to know enough to know when an old library building is beautiful, but we do not know enough to know how to assess new ideas.

Part C

Targets for Research

Introduction (References 1-8)

It would be interesting and possibly important to try to do a study of library buildings similar to Costello's "The Scholastic Curriculum at Early 17th Century Cambridge," based on the testimony, if it exists, of librarians and architects of early buildings---particularly Leopold della Santa. This study need not be brought beyond the 1890's.

Objectives of Planners (References 9-50)

Except as librarians are placed in an administrative relationship that enables them to know what their parent institution is doing, there seems to be no known way of advancing our understanding of how to improve library objectives beyond their present state. Improvements come either from new technological advances or from new concepts developed by architects and librarians. It is possible that an imaginative librarian might be given time to study contemporary trends in higher education in much the same way Conant is studying the American High School, so as to extract from them a deeper insight into library needs that are not known or understood very well by busy practitioners. For example, a study of enrollment trends might enable one to analyze their building needs more intelligently than they now do.

It is possible that a study of the working behavior of users of scholarly libraries might give librarians better insight into the proper provisions for faculty

research offices and carrels.

Analyses of how well stated objectives have worked out ten years after might be made for a few buildings. For instance, a study of the buildings at Nebraska and Colorado might shed light on the validity of the claim that the subject divisional plan facilitates the work of border line researchers more than does a system of departmental libraries.

Planning Principles, Methods and Procedures (References 51-70)

A historical study of early 20th Century planning methods for specific buildings in light of the known value of these buildings would be useful.

An evaluation of the buildings that have been planned by the Cooperative Committee on Library Building Plans would be useful in determining the worthwhileness of that method of planning.

Contemporary Planning (References 71-76)

A careful analysis of library programs developed by research libraries during the last ten years would be a useful document for future planners and as a commentary on higher education during that period.

It would be most important to make a study of what specific consultants did on the building plans for which they were responsible.

Formal Group Criticism of Plans (Reference 81)

Here again it would be important to make a follow-up study of the libraries that subjected their plans to this method, to see how the criticisms affected their thinking.

Proper Use of Librarian in Planning (References 82-98)

Historical studies of the rôle the librarian played in the planning of good pre-World War II buildings---Illinois, Yale, Swiss National Library, University of Colorado, Library of Congress Annex---might be worth doing.

The same kind of study could be made of the post war buildings with emphasis on finding out what the architects in these buildings thought of the usefulness of the librarian and vice versa.

The question of whether the librarian or the architect should originate and dominate the writing of the program looms large in the literature, but in retrospect it is probably not an important problem.

Rôle of Boards and Building Committees (References 99-103)

This is an important problem and it deserves careful study. What have boards done on specific buildings that was good and bad? Was the University of Wisconsin rejection of contemporary concepts the result of the faculty committee's thinking, or the librarian's, or the architect's?

Architectural Competitions (References 100-103)

Since competitions are commonly used in Great Britain and on the Continent, it might be worthwhile looking into the reasons why they do so. It is obvious to an outsider that European libraries (the new ones at least) achieve a more honest architectural expression than do American libraries. Does the competition have anything to do with this? The question is worth studying. It is possible that our American liking for monopolies and our avoidance of real competition is depriving us of architectural distinction.

Factors that Determine the Planning Method and Concept of Design (References 104-108)

The aesthetics of functional libraries should be studied by a wise man. Is Hudnut or O'Connor right?

New Methods and Techniques

1. "Scientific" Planning (References 109-110)

This method has been used with much success in special libraries and in the area of technical processes. The question of how to apply it to the rest of a library's operations is relevant. Studies of this kind should be attempted---department by department.

2. Modular Planning (Reference 111)

It is not possible to evaluate this method of planning until we can evaluate the modular method of construction. Modular planning is different from fixed function planning, because it must start with a program which includes a description of functions to be performed and a quantification of the same. Good planning for fixed function buildings should also start this way, but they seldom do.

Thus, an historical study could be made of the way the new concept has influenced the planning method.

The Factor of Obsolescence (References 112-114)

The lines of thought with which solutions to the problem are being sought are: 1. modular construction; 2. different type of building for each known function; 3. micro-reproduction; 4. specialization of collecting agreements; 5. regional storage centers.

It is probably too early to evaluate the effect of any of these lines.

In the meanwhile, research on modular construction would seem to be the most useful way to step up progress. Architects have gotten away from the simplicity and economy of Macdonald's concept. We should find ways and means of going back to it. Macdonald, himself, should be encouraged to work on the problem while he is still able to do so.

How Libraries Have Housed Functions

1. Space for Readers (References 115-131)

This is an important problem. It needs to be studied in terms of campus-wide study facilities and in terms of what the student needs to read. The problem is somewhat intangible but should be tackled. Different methods of teaching should be analyzed in terms of the study conditions they require.

Space for Books. Further understanding of this problem will depend on technological developments.

A specific job should be done right now on the implications of the Zerox Copyflo process for cooperative reduction of research materials to microfilm in certain subject fields.

Muller's studies of compact storage seem to be adequate, in terms of American technology. But after seeing European installations of Compactus, I think some one should investigate what costs would be here if that particular installation were used.

2. Organization of the Book Stacks
(References 138-140)

No research needed until further technological improvements are available.

Question of Open vs. Closed Stacks: Much research is needed on this problem. We need to know

if the claims that are made for open stacks are justified for undergraduates. Would it be better to give undergraduates a separate library and then close the stacks except to researchers?

The problem is difficult but should be tackled soon and by someone who can get outside traditional library thinking about this problem.

Housing of Non-book Materials

Not primarily a building problem.

Carrels: A small study might be set up to find out if researchers in the historical disciplines would be satisfied if they could be given a "shelf box" which they could hang on stack uprights wherever they may be working, instead of an assigned carrel. Not a matter of great importance.

Centralized vs. Decentralized Buildings

At what point does the size of a library force decentralization?

Research on the application of the new electronic mechanisms to library use will be important. The research now under way is relevant.

Pressure from the 1962 enrollments will force universities to use all kinds of mechanical aids to teaching. Any research that will throw light on this coming problem would be useful.

Somewhat related is the problem of reproducing, as Rider once suggested, the basic books undergraduates need in multiple form so that much of their basic reading could be done outside the library.

Also, we need some studies of the possibilities of dormitory, or house, library systems. Are they eco-

nomical solutions to the problem of freshmen reading?

Research now under way in the areas of science, on the ways scholars work may have some bearing on the question of departmental libraries. It would be useful to have someone summarize these studies.

Undergraduate Libraries (References 185-193)

The question of whether a given campus should make the separation point at the undergraduate vs. graduate level, or at the end of the lower division or general education level is still unanswered. The question should be studied in terms of costs, size of populations and effect on the central building.

Does Dix's point of view apply only to small, highly selected student bodies, or is it possible that he is right that separate undergraduate libraries harm students in that they make them lazy? The question is relevant.

Someone should take a hard look at the question in terms of teaching methods. To be specific, what kind of library facilities are needed for an inductive method of teaching if anyone should want to try to use it at the undergraduate level?

Nature of Organization of Space

Studies should be set up to test the assumptions Ellsworth stated (Reference 196) concerning the subject divisional plan against the operations of the libraries that have used that organization of service.

Conference Rooms: Not a significant problem.

Seminars: Not a significant problem.

Reserve Book Rooms: Not a significant problem.

Processing Department: Except for integrating the new procedures resulting from new developments in centralized cataloging and new machines, no research is needed on the physical housing problem.

Lecture Rooms: It is possible that the use of closed circuit TV systems and other mechanical aids to teaching will create a demand for receiving as well as "sending" laboratories in libraries. It would be useful to have someone watching developments in this area for librarians.

A-V Rooms: The problem is one of helping librarians understand the need for A-V facilities. No research is needed to do this.

Reference Rooms: A careful analysis of the reference room functions in a university library should be made, especially now that research in informal retrieval methods is beginning to pay off.

Modular vs. Fixed Function Buildings

Research is needed on the following points in modular construction:

1. Ventilation and lighting. How to provide adequate ventilation and good lighting without making the floors so thick that the advantages of the method are lost.

2. How to provide ventilation outlets that will not carry sound from one room to the next and still permit the moving of walls.

3. How to provide light switches so that they can be moved where partitions are moved.

4. Should there be one size for all modules in a building, or can there be different sizes, or some areas that are fixed in nature?

5. What are the virtues of the modified modular method used at Rice and M. I. T. ? That is, the possibility of inserting, as needed, an intermediate floor between each two floors?

6. Could greater economy be achieved by using Macdonald's method of hollow column construction? Architects were opposed to this early in the game when they tended to be opposed to the whole method. It is time for a fresh unbiased reappraisal.

Library Lighting

No research is needed. This is not to say that more research on lighting is not needed, but rather that with our existing knowledge we can do a satisfactory job of providing good lighting.

Ventilation

Research is needed on all aspects of ventilation in libraries, particularly modular libraries, because they are 100 per cent dependent on artificial ventilation.

It may be, of course, that engineers know all they need to know about ventilation but that they are seldom allowed a free hand in planning, but I doubt if this is true. I am sure that the average architect and engineer has no conception of how to ventilate a research library.

Acoustical Levels (Reference 273)

No research needed.

Floor Coverings (References 278-280)

Research is needed to bring our knowledge up-to-date. Someone should look into Kilham's suggestion that maple floor laid in mastic has lasted well in school buildings.

The Technology of Building

It is obvious that research is needed on all aspects of building technology, but this is not a problem the Council can do much about except to try to tell architects why libraries need to be built better at a lower cost.

Codes

Here again, research is needed but this is not essentially a library problem.

Aesthetics

Although this is not a librarian's problem, yet there is truth in Dean Hudnut's claim that librarians cannot be ignorant about the aesthetical quality of libraries. What is needed is more of the kind of enlightened exploration of the subject that men like O'Connor are able to give. Beyond this, we can do no more than put our faith in architects that seem to have the touch of genius---like Aalto, Sarinnen, Murphy and Izunni.

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Volume Three Part Two

SHELVING

by

Louis Kaplan

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The Literature of Storage

I. Storage of Books

A. Reports on the Literature

1. Separate Storage Areas for Books

The first advocate of a separate stack area for books, according to Remon (1) was Leopold della Santa, whose book, "Della costruzione e del regolamento di una pubblica universale biblioteca," was published in 1816.

Burgoyne in 1898 presented the case for separate storage areas for books as follows: While providing space for readers equal to the number of readers accommodated in an alcove system, almost twice as many books can be shelved in a library with separate areas for books and for readers. (2)

2. Shelving by Size and the Height of Book Stacks

Melvil Dewey advocated limited shelving by size to accompany relative location. To use more than four shelving categories, he believed, would destroy the usefulness of classification. His recommendations were as follows, based on his statement that 80 per cent of the books in a circulating library will stand in a shelf space 10" high (3):

Size 1. 10" high and 8" deep
2. 12" high and 10" deep
3. 14" high and 10" deep
4. 20" high and 16" deep (larger books

would be shelved on their sides)

Dewey's determination of the height of a book stack, based on the use of wooden shelves, was arrived at by these calculations (4):

8 shelving spaces at 10" each	80"
8 shelves at 1" each	8"
height of base	4"
depth of cornice	4"
	96" equals 8'

Burgoyne believed that 75 per cent of all books would stand in shelf spaces eight to ten inches high. In a height of 87" (including the thickness of 3/4" shelves, but excluding the base) he could provide 8 shelving rows for books up to 10" and 10 rows for books up to 7-3/4". Folios he would put in wall cases. Burgoyne describes the Chivers system which made possible infinite adjustability of shelving (5).

In the Library of Congress (completed 1897) the stack heights were 7'. In the New York Public Library (completed 1911) the heights were 7'6". (6)

Describing Harvard's shelving system in 1916, Lane said they tried to provide 6 shelving spaces, of which one was for folios, and the remaining five were spread 11-5/8" apart. Their stack heights were irregular, not from choice, and these combined with an unfortunate shelf adjustability at 1-1/8" intervals, made impossible their original plans to provide 7 shelving rows for octavos. (7)

In 1921 there was announced the Lambert-Fortune Bookstack which made possible shelf adjustments down to 1/8". (8)

Walter saved space in his stacks by shelving his very largest folios in a separate room. (9)

In his book of 1932, Gerould stated that most recent stack installations were 7'6" high. He recommended arrangements in stacks which would accommodate octavo (85 per cent), quartos (12 per cent), and folios (4 per cent). (10)

Van Hoesen and Kilpatrick, writing in 1934, reviewed the various stack height proposals and noted that all were related to the heights of human beings but not to the height of books. Only Yale, they claimed, had studied the height of books, where they had found 87.5 per cent to be 26 cm. or less. Van Hoesen's measurements at Brown of 100,000 volumes showed the preferred divisions in shelving to be at 25 cm. (82 per cent) or at 28 cm. (92 per cent). If 26 cm. were used as the breaking point, a stack 1/2" high would serve well where the adjustability of the shelves was set at 1" intervals. Using the same adjustment interval, an 8' stack would be required if the breaking point were taken at 25 cm. With 28 cm. the stack height would need to be 7'8". Putting it another way, Van Hoesen claimed that with 1" adjustability of shelves, in stacks 7.5' high, the number of shelves for books up to 26 cm. tall would be no greater than for books up to 28 cm. The Van Hoesen article also provided percentages for over-size books and declared the shelving of them in the bottom shelves of ranges to be uneconomical. (11)

Henderson argued that the height of a man must determine the height of a stack, and that books must be fitted to the stacks. He, therefore, favored a stack height of 7.5' in which there could be provided 7 shelving rows spaced 11.5" apart. The New York Public, he claimed, had studied these matters years ago and had come to the conclusion that the best divisions were at 11.5" and 19". Larger books were shelved flat. (12)

Further measurements of books at Brown served to corroborate their earlier findings. In contrast to Yale's discovery of 87.5 per cent for books up to

26 cm., Brown's discovery was 89 per cent. If 26 cm. is taken as the breaking point, they would recommend (including height of base) 86" for 7 shelving rows, and 97" for 8 rows. In a stack 7.5' high, the best arrangement was 7 shelving rows at 28 cm., or 8 rows at 26 cm. They considered their figures inconclusive on oversize books. For certain subjects, the authors of the article showed the percentage of books up to 25 cm. (13)

3. How to Calculate Capacity

Dewey assumed 10 volumes to the linear foot.(14) Burgoyne believed the average to be 8.5 volumes, assuming 10 for octavos and 6 for folios and quartos. With cases 7'6" high and aisles 32" wide, and an average of 9 shelves to the section, he calculated 38 volumes to the square foot exclusive of the space required for windows, stairs, etc. (15) Snead and Company gave estimates of the number of volumes per linear foot in law, medicine, fiction and economics, technical books, and general literature. (16)

Gerould estimated 15 volumes per square feet of floor area (including aisles, elevators, etc.). Another formula he recommended was 50 volumes for each running foot of single-faced range. (17)

Henderson warned of estimates of capacity in which the depth of books was neglected. On the average, taller books occupy a greater volume. Therefore, a more precise measurement of capacity is provided by cubic content. (18) In a later article Henderson showed how to use cubic content to calculate capacity of shelving. Using actual counts made at Yale and the New York Public, he came to the conclusion that in a section of books there would be 147 octavos and 75 quartos. Because folios require two sections simultaneously, he estimated only 13 to a single section. Thus, if the number of sections is known, the capacity can be estimated, assuming 85 per cent to be octavo, 13 per

cent quarto and 2 per cent folio. (19)

Metcalf confirmed Gerould's earlier estimate of 15 volumes per square foot, adding details which were not given by Gerould. Metcalf assumed ranges at 4'5" centers and that stairs and elevators would consume 25 sections, leaving 1,175 sections (each three feet long) in 10,000 square feet. Assuming 7 shelves to the section and 6-1/10 books per foot there would be 150,000 volumes, or 15 volumes per square foot. If the stacks are 7'6" high there would be 2 volumes in each cubic foot. (20)

4. Compact Shelving

Dewey regarded 30" as the standard width of aisles between ranges. If little used materials were stored, he felt even so little as 24" possible. (21)

Garnett described a compact installation of 1877 in which "split" swinging sections were used similar to those made today by Art Metal. Another very early installation in England employed the "unsplit" swinging sections, the same as later adopted in the Midwest Inter-Library Center. (22)

News of the installation of sliding "presses" (ranges) at the British Museum appeared in 1887. As explained by Jenner, the "iron library" in the Museum, in which girders were supported by masonry piers, permitted the attachment of iron runners to the girders overhead. The new ranges were then attached to the runners. (23) Further details of the installation were provided by Dewey, who was in correspondence with Jenner. The new ranges were deep enough to permit the shelving of two rows of books on each shelf. Thus, each new double-faced section increased the rows of books per shelf by four. The total per shelf, previous to the new installation, was two rows; the new installation brought the total to six, a trebling of capacity. (24)

A few years later (1893) a writer suggested sections on wheels shelved together without range aisles which could be pulled endwise into a transverse aisle when necessary. (25)

In 1895, Mayhew claimed that the "unsplit" swinging section would almost double book capacity. (26)

In 1902 a central storage building was suggested. The books were to be stored by size without benefit of classification. The ranges were to be long, ending at walls, with only one transverse passage down the middle. On each shelf there were to be three rows of books. (27)

In 1911, Bowdoin College was using tracks on which single-faced sections were slid forward as needed. These increased the capacity by no less than 100 per cent according to their librarian. (28)

In its book, "Library planning," of 1915, Snead and Company recommended aisles 27" wide for storage, and ranges up to 30' long. (29)

In 1931, Toronto announced the installation of sections on casters which were pulled out endwise into a transverse aisle, as had been suggested in 1893. The installation was used for books in storage. (30)

In his book of 1932, Gerould discussed the wastefulness of 36" sections for shelving of newspapers for which he recommended special shelving. (31)

The storage library at Ames, Iowa had only one transverse aisle, there being none at the walls. (32) The same was true of the New England Deposit Library. The sections devoted to books in the New England library were 41" wide, and the range aisles were 26" wide. Newspaper shelving was 28" wide, and the aisles 30" wide. (33)

In 1949, Rider claimed that complete shelving by size would result in a gain of 25 per cent. (34) By turning books down on their spines, Rider claimed a gain of 50 per cent. (35)

The Midwest Inter-Library Center claimed that by sizing its books it could increase the number of books standing in conventional shelves from 755,000 to 2,090,800. Through "hinged" shelving and by sizing it claimed a capacity of 3,150,000 volumes. The theoretical space available for books was 514,500 cubic feet. (36) Soon after, Esterquest claimed that by using six size groupings the increase in capacity would be 150 per cent. The New England Deposit Library, he stated, had found that it could gain slightly more than 100 per cent by using seven size groupings. (36a)

The compact system named after Ingold, a Swiss engineer, employs double-faced sections which are moved forward (as was true of the installation at Bowdoin College) by motors. An increase of 100 per cent or more is claimed for this system. In describing the savings in costs of the Ingold system, Kaiser gave this example. Assume a room 660 cbm. (or 27,000 cubic feet) which through use of the Ingold system could be reduced in size to 300 cbm. If 660 cbm. cost 72,600 Swiss francs, 300 cbm. would cost 33,000 Swiss francs, a savings of 39,600 Swiss francs. The cost of the Ingold installation would be 15,000 Swiss francs. Thus, the actual savings would be 15,000 Swiss francs subtracted from 39,600, or 24,600 Swiss francs. (37)

Yale developed a storage plan using a Remington-Rand bracket shelf only 4" high in order to accommodate sizing. Another feature of the plan was the aisles which were 20" wide. (38)

Muller in 1954 presented an analysis of the cost per volume of different kinds of compact shelving made in the United States. He also showed the capacity increase resulting from various reductions in the width

of aisles. Muller then showed the percentage gain in capacity for various kinds of compact shelving compared to conventional shelving. He is then able to show the cost of shelving 100,000 volumes in each system, and at varying building costs. These costs are given for a single story stack. For comparative purposes Muller gives a brief analysis of costs of Compo shelving in a four story stack. (39)

Other capacity gains were reported in 1955 in an article by Hill. At Southern Illinois, Muller was reported to claim a gain of 40 per cent by reducing aisles to 22.9". Yale's installation, by reducing transverse aisles in number and using range aisles 20" wide, is said to have achieved an increase of 60 per cent. In the Royal Library at Stockholm they introduced sections which slide sideways on overhead runners; by using five layers, the increase in a single room was 176 per cent. The Ingold system had resulted in an installation which increased capacity by 115 per cent. The Midwest Library was reported to have gained 66 per cent over conventional shelving. If compared to conventional shelving where the aisles were only 29" wide, Midwest gained 44 per cent through use of its hinged shelving. (40)

Gosnell compared shelving and Compo shelving, assuming a building cost of $1.50 per cubic foot, the cost of conventional shelving $3 per foot, and the cost of Compo $5 per foot. In a building of 40,000 cubic feet, in which he assumes an installation of 10,000 linear feet of conventional shelving, the cost would be $90,000. Because Compo reduces the building cost by half (thus, $30,000) the cost of Compo plus the cost of the reduced building comes to $80,000. (41)

In 1957, the New York Public Library announced that it had adopted eight categories of shelving. (42) The increase in capacity was privately calculated at 20 to 40 per cent. (43)

B. Comment on the Reports

Stack heights obviously are related to the heights of books and to the percentage of octavos, quartos and folios. Statements by Dewey,(4) Burgoyne (5) and Gerould(10) as to the height of stacks apparently did not stem from actual counts of books. Not until Van Hoesen(11), Kilpatrick(13) and Henderson(12) were librarians provided with this kind of information based on actual counts.

Of the various pronouncements dealing with the number of books per linear foot (see 14, 15, 16, 20), the basis of the information was not revealed. The same can be said of statements relating to the number of volumes per square foot (see 17 and 20). Henderson's statement of the number of octavos, quartos and folios in a section(19) was based on actual counts made at Yale and the New York Public Library.

Early claims as to the efficiency of compact shelving were entirely unsubstantiated (26, 28, 36a). Rider's claim that a gain of 50 per cent would result from placing books on their spines was based on actual experience. (35) Rider presented no evidence for his statement that a gain of 25 per cent would result from the sizing of books shelved upright. (34) The New York Public Library made no public announcement of the gain expected from sizing. (43)

Muller made theoretical calculations showing the gains resulting from narrowing of aisles. (39) By reducing the width of aisles to 20" the installation for the Yale Divinity School is said to have developed a gain in capacity of 60 per cent.

Evidence of savings in cost effected by compact shelving was almost non-existent. For installations at a single level there were the figures provided by Kaiser based on the Swiss experience(37) and the figures provided by Muller. (39) Muller's figures were

theoretical, being based on cost estimates given him by suppliers.

For multi-story installations Muller (39) used figures supplied by the Hamilton Manufacturing Company. Gosnell (41) does not state the source of his information.

II. Storage as Affected by Microcopies

A. Reports on the Literature

1. How to Store Microcopies

In 1932 Henry reported that the Library of Congress stored microfilm on open shelves, film being considered no more inflammable than manuscripts. (44)

Metcalf showed the waste of space resulting if only the front portion of shelf is used in storing microfilm. To get more effective use, he recommended storing the cartons in larger containers. (45) At the New York Public Library the containers varied in size, taking six to ten cartons. (46)

For storing strips of film, Dice recommended stationers' envelopes size 10 (4-1/8" x 9.5"). Each envelope is then divided into compartments with paper partitions. In a single envelope may be stored all the strips cut from one roll of 35 mm. film. A book of 96 pages, when filmed two pages to the frame, can be cut and fit into a single envelope. (47)

The Historical Society of Pennsylvania preferred reels to strips because these were "most satisfactory" both for readers and storage. No reel was considered complete until it contained 100 feet of film. (48)

Fussler warned as to the waste resulting from short runs of film and recommended strips in envelopes as a remedy. As for the cartons in which reels were

placed, these should be stood on edge in order to utilize the full depth of shelves. Though convenient, steel cabinets were more expensive than shelves. (49)

According to Ballou, envelopes containing strips of microfilm should be stored as are cards, that is, in drawers. Microcards should be similarly stored. (50)

In 1956 Weber described Harvard's new method of storing reels of microfilm. Previously, Harvard had shelved film in individual cartons. On each shelf they had stored two rows and two layers. The shelves were 40" long. On eight shelves they could store 768 reels. To increase capacity they designed a microfilm box 10" long by 4" deep by 4" wide. The box (with a hinged top) is constructed of fiber board and is edged with metal. It is shelved so that its narrow end faces the aisle. The boxes can be shelved in two layers. The number of reels that can be stored in the same amount of space as formerly is 864, or 13 per cent more. Compared to film cabinets the percentage gain is 40. Boxes cost 5.6 cents per reel of film compared to 17 cents for cabinets. The cost of the metal shelves and the fiber boxes is less than the cost of cabinets.(51)

2. Building Costs Related to the Costs of Microcopies

In 1947 Metcalf claimed that with the exception of newspapers, and unless the sale of copies of microphotographic reproductions could be appreciably increased, "it will always be cheaper to keep the originals in inexpensive storage than to make or purchase microphotographic reproductions."(52)

Rider argued that, "Storage cost is so overwhelmingly important that, on the average, it outweighs all microcard costs." He believed that every research library would save money if it discarded the larger

proportion of the volumes now on its shelves, even taking into account the cost of acquiring replacements in the form of microcards. He claimed that the capitalized annual cost of shelving a volume is 16 cents. (53)

Irvine reported a study of costs made by the National Archives which show that "micro-reproduction is not a generally applicable means of reducing the costs of storing records. For records that are not to be preserved beyond thirty years and for records that cannot be microfilmed at a very low cost, it is simply cheaper to provide suitable warehousing." (54)

Esterquest, using as an example a periodical set of about 35,000 pages shelved at Iowa City, estimated that it would cost $23.90 to change the records and ship the volumes to the Midwest Center, whereas the cost of a microfilm copy would be $637.80. The capitalized annual cost of storing the volumes in Chicago would be $1.40, compared to 10 cents for the film. If a set of 15 microcards could be sold, the first cost would be $153.80, and the annual capitalized cost would again be 10 cents. (55)

Pritsker and Sadler made a study of the cost of microfilming books compared to the cost of storing the same collection in its original printed form, using 3,000 linear feet of books placed in storage by the School of Engineering at Columbia as an example. They found that filming at a reduction of 16 to 1 was more expensive than shelving the originals even when stored in a building which cost $25 per square foot. At a figure below $17 per square foot, storage of the original is cheaper than filming at a reduction of 24 to 1. At a figure below $12 per square foot, storage of the original is cheaper than filming at a reduction of 37 to 1. These figures were based on production of only the negative copy. (56)

B. Comments on the Reports

Whether microfilm on reels is from the viewpoint of storage to be preferred over film strips (48) has not been demonstrated.

The findings at the National Archives (54) relating to the cost of storage have not been supported by evidence which permits checking the results. Even more tantalizing is the unsupported reference by Irvine (54) to the relationship between filming costs and the length of time during which records must be kept.

Pritsker and Sadler's study is (56) seriously affected by two circumstances. In basing shelving costs on Muller (see section I of this study), they bind themselves to a single-story book stack. Also, Pritsker assumes film cabinets will be used for storage, while with regard to books he postulates conventional shelving systems. As is well known and easily demonstrated, storage of film can be achieved at less cost in conventional shelving systems than in cabinets.

Because of the lack of suitable reading equipment, Fussler (49) no longer recommends the use of film strips as a means of avoiding waste in short runs of film on reels. (56a)

III. Storage of Other Non-Book Materials

A. Reports on the Literature

1. Materials Stored Vertically in Filing Cabinets, Boxes or Shelves

In 1889 several libraries reported the use of boxes standing vertically on shelves for storage of unbound pamphlets. (57)

In 1908 Drury reported that small maps in some

libraries were kept in vertical files. These, he said, must be kept in manila folders, which reduces capacity by "fully half if not more." (58)

At the Newark Public Library they filed prints vertically in boxes. (59)

Compartmentalized cases in which prints and bound volumes of sheet music were shelved were reported in 1911 by the Metropolitan Museum of Art (60) and in 1916 by the public libraries in Brookline and Brooklyn. (61)

At the New York Public Library theatre clippings were mounted, placed in folders and stored in vertical files. Theatre programs were filed in manila folders and shelved in vertical files. (62)

In 1937 Margaret Smith pointed out that per cubic foot of floor space, more pamphlets could be stored in shelves than in vertical files. (63)

A committee of the Music Library Association in 1937 recommended vertical storage of music records in cabinets in which partitions were set no more than seven inches apart. (64) McColvin recommended a shelf 18 inches wide, subdivided by compartments six to nine inches wide. (65)

At Harvard in the library of the Business School, letters were placed in boxes which were stored upright on shelves whenever there were enough letters in a box to pack them tightly. If not packed tightly enough to prevent crumpling, the boxes were laid flat on shelves. (66) At the University of North Carolina, manuscripts were shelved in vertical files, while at the Library of Congress these were mounted and bound about 150 manuscripts to the volume. (67)

In 1938 Morley reported that almost without exception librarians prefer vertical files for non-book materials because files are more adaptable to materials of different sizes and shapes. Within the files, Morley reported the most often used container to be the folder. The principal

argument against the vertical file, according to Morley, was the cost, "which is somewhat higher than shelves in proportion to storage space provided and under some conditions to the floor space required for the same amount of material." In one square foot of floor space a bookcase of five shelves will provide 59.2 lineal inches of shelving, compared to a file of four legal-size drawers which provides 30.4 inches, a correspondence-size file which provides 38.2 inches, and a legal-size file of five drawers which provides 37.7 inches. On the other hand, because a "fair proportion" of the material stored in files is octavo in size, two rows can be shelved in legal-size files (that is, standing upright and alongside). In a collection where one-half the material can be shelved in this compacted manner, the number of lineal inches per square foot which can be stored in a four-drawer file is 45.6 and in a five-foot drawer file the number is 56.6. Furthermore, unbound material on shelves is usually kept in a container which reduces the space available for storage by one-sixth. Thus, the number of lineal inches is reduced from 59.2 to 49.3. The author also declared that when material is little used, vertical files can be compacted in the manner of sliding book shelves. (68)

Condit wrote that "more floor space is required for vertical cabinets than would be required to accommodate the same number of pamphlets in library stacks. More space is needed to accommodate the readers since the drawer must be pulled from the cabinet." (69)

Brown reported that some librarians prefer to place old maps in vertical files, a practice with which he disagreed because many old maps will not support their own weight, and if a heavy folder is used to support the map a loss of storage space results. (70) Small maps, to avoid wasting space in large drawers, should be placed in letter files. (71)

Of 14 libraries questioned, according to a report made in 1942, all stored photographs vertically either in drawers, boxes or compartmentalized cabinets. (72)

A committee of the A.L.A. studying the Army Map Service Project reported that maps filed vertically, because narrower aisles are possible, require less floor space than those filed in drawers, and that costs were comparable. (73)

An investigator reported in 1947 that of 49 libraries, 36 shelved music records vertically, the remainder horizontally. (74)

When filing cabinets are planned for book stacks, the traditional arrangement of columns on 4'6" centers must be abandoned. (75)

Martin recommended partitions spaced three inches apart for music records, but when albums were shelved the partitions could be spaced at five to seven inches.

Collison stated in a book published in 1950 that the horizontal filing of maps is less satisfactory than vertical filing because in horizontal files the partitions take up too much of the available space. (77)

According to LeGear, vertical map units require less floor space than horizontal units, but not less wall space. (78)

Music records, reported Duckles, could be accommodated on plywood shelves with fixed partitions, these placed directly on metal shelves. Single LP discs could be placed in vertical filing cabinets of legal paper size. (79)

At the library of the National Geographic Society oversize photographs were placed vertically in metal compartments. (80)

In 1955 a committee of the Royal Geographical Society reported that vertical filing of maps is satisfactory only for long series of small, uniform sheets.(81

Good shelving for music scores, according to Duckles, requires a shelf of generous width (11 to 12 inches), with adjustable partitions. The same kind of shelf will serve music records. (82)

2. Materials Stored Horizontally in Drawers, Shelves and Boxes

In 1891 Harvard was using map cases 33" x 52", while those at the U.S. Geological Survey were 41" x 60". Harvard's cases consisted of shelves on which the map portfolios were placed. The Geological Survey used drawers. (83) Parsons claimed that shelving spaces for maps should not exceed 36" x 42". (84)

At the Library of Congress roller maps and pocket maps (except those with text) were altered to sheet form and filed flat. (85)

The New York Public Library used map drawers 40" x 53". (86)

Drury recommended drawers for maps no deeper than 2". He computed storage capacity of cases at 100 to the inch. (87)

Based on the experiences of the Library of Congress, Fitzpatrick recommended the flat storage of manuscripts contained in stiff portfolios or books. (88) At the Huntington Library manuscripts were placed in folders 13" x 10" and 16" x 11". The folders were then put in boxes and stored in double-faced shelves, that is, in a depth of 27". A few special sections for maps were 32" deep. Deeds with seals were mounted on frames and shelved flat in boxes lined with cotton wool covered with waxpaper in order to prevent absorp tion of the moisture in the seal. Deeds without seals were not mounted but placed in envelopes which were then put in boxes. (89)

At the New York Public Library photographs wer

mounted on heavy manila paper measuring 12" x 18". These were then put in boxes and shelved horizontally. (90)

Those who wished to store materials flat but consult them in a vertical plane for convenience could purchase special cabinets for music records (91) or, as was done at the New York Public Library in its theatre collection, a system of hooks and rods enabled the user to hang a box in the vertical position. (92)

At the British Museum various materials were mounted. The size of the mounts adopted were 22" x 16"; 27" x 20"; and 32" x 24". The mounts were placed in Solander boxes which could be shelved either vertically or horizontally. (93)

At the Baker Library at Harvard, boxes shelved horizontally were of two sizes: 12" x 10-3/4" x 2" and 15" x 10-3/4" x 2". (94)

Brown noted that most old maps were limited by the size that could be made by hand, the average being 28" x 24". Judging from sizes he encountered most often, he recommended map cases 24" x 40". The depth of the drawers should not exceed 2.5" because deeper drawers involve a type of construction that is not economical. (95)

Agnes Whitmarsh calculated the number of mounted (but not folded) maps that can be filed in a one-inch folder to be 35 to 50. Unmounted and unfolded maps could reach 150 to the inch. The average, she believed, is 100 to the inch. (96)

LeGear recommended the use of sectional map cases to a height of six feet where space is at a premium. The measurements recommended by this writer were 30" x 44" and drawers 2.5" deep. (97)

The capacity of map cases was calculated by the

U.S. Army Map Service at 25,000 maps in a space 13' x 12' x 8-2/3' high. (98)

When the department of maps installed new equipment at the Bibliothèque Nationale, they remained faithful to their previous practice of portfolios stored flat on shelves. On the uppermost shelf, at a height of about 4.5 feet from the floor, atlases are stored upright because they are easier to handle in this position. Readers wishing to acquaint themselves with the size groups used at the Bibliothèque Nationale should consult the article by Foncin. (99)

In a report by a committee on maps of the Royal Geographical Society, the suggestion was made that maps whenever possible should be dissected and mounted rather than folded. They considered standard drawers for maps to be 31" x 43" and 32" x 54". The depth of shelves should not exceed 2.5". To subdivide the contents of drawers, stiff manila folders should be used. In a map collection used frequently, the top drawer should not be more than five feet from the floor. In collections of considerable size where use is minimal, shelves are to be preferred because they offer a great capacity. (100)

3. Storage of Non-Book Materials Offering Unusual Problems

In 1892 Larned recommended the storage of rolled maps in tubes. (101) In 1908 Drury stated the three principal methods of dealing with rolled maps: hang them at their ends by hooks; stand them in racks similar to umbrella racks; lay them in long narrow drawers. (102)

At the Huntington Library court rolls are sewn together and rolled upon pieces of cardboard tubes which are protected by a sleeve. The tubes are then placed in boxes. (103)

Motion pictures in round containers can be placed on shelves if a strip is nailed across the front of the shelf to prevent containers from rolling to the floor. Both ends can be used to keep the containers upright. (104)

Slides are generally stored in boxes containing 50 or more. Each slide stands on edge in an individual compartment.(105) Filmstrips are normally stored in small tin containers about one inch in height, so that 36 containers can be stored in a space 12" square and two inches deep. Special cabinets for these containers are available. (106) For an interesting homemade container for filmstrips the reader is advised to consult the article by Godbey. (107)

At the American Merchant Marine Library Association special trays were devised to store photographic "cuts." These are stood on edge. (108) At the library of the U. S. Coast and Geodetic Survey special racks were constructed for field survey sheets rolled in metal tubes. (109) At Columbia large maps were suspended vertically by hooks in compartments in which the maps could be revolved for ease in handling. (110)

According to a recent questionnaire sent to librarians, about 93 per cent reported storing motion picture film in metal or wooden racks, as against cabinets. Filmstrips were generally stored in cabinets, second choice being chests of drawers. (111)

B. Comment on the Reports

The central problem pertinent to the vertical storage of non-book material is whether filing drawers or standard shelves are to be employed. Smith's claim (63) that greater capacity results from use of standard shelves is unsupported by evidence. Morley (68) made a careful study of the evidence but began with the assumption that her shelving would reach no higher above

the floor than do filing drawers. This assumption can be challenged because boxes can easily be taken from shelves at a height above the eye level of the user. Even so, as the only analysis of its kind, and because her approach may otherwise serve as a model, Morley's work deserves attention.

Morley's argument also rests heavily on the assumption that a "fair proportion" of non-book materials can be shelved in two rows in legal-size filing drawers. While this statement may seem to fit the experience of most librarians, no actual measurements are cited by the author.

Finally, Morley declares that filing cabinets may be compacted in the manner of sliding book shelves. Here again the assumption is an unproven one. Materials on sliding book shelves are commonly turned at right angles to the aisle, and when the shelf is pulled out, the reader directly faces the labels on the boxes. But folders in filing drawers of the kind presently designed cannot economically be turned at right angles to the aisle; if the materials were pulled out into the aisle the reader could not inspect the folders readily unless he could face them directly.

Condit (69) argues that filing drawers require more space than shelves because "the drawer must be pulled from the cabinet." But in compact shelving of books space is saved precisely because shelves from either side may be pulled into the same aisle, thus reducing the space requirements for aisles by one half. Had Condit considered the possibility of turning the materials in sliding shelves at right angles to the aisles he might have come to the conclusion that the sliding shelf is an advantage.

The statement has been made (see 73 and 77) that maps filed vertically require less floor space than those filed in drawers. LeGear (78) makes the same declaration, but states that vertical map units do not

require less wall space. Unfortunately, no solid evidence is submitted by any of these writers.

Prints, bound sheet music, and music records are almost everywhere shelved vertically. In the articles describing these arrangements no effort is made by authors to consider whether other methods might produce greater storage efficiency. This situation is not surprising because convenience of access to these materials remains superior to any consideration of savings in storage.

With regard to the horizontal storage of maps a variety of sizes of cases is noted (see 83, 84, 86, 95, 97, 100). The diversity of sizes recommended is in not a single instance buttressed by actual measurements of maps in hand.

The decision of the Bibliothèque Nationale to store its maps on shelves rather than in cases (99) may have been based on nothing more than tradition. At any rate, we are without precise knowledge of the gains in storage effected by this procedure. In advocating shelves for large collections of maps for the reason that greater capacity results, (100) the committee on maps of the Royal Geographical Society offered no evidence by which this claim could be put to the test.

IV. Targets for Research

A. Book Storage

The relationship of stack heights to book heights is based on actual counts of books at Yale and at Brown. At the latter institution, periodicals were separately shelved from books and not included in the count. (112) At Yale the count included both periodicals and books. (113) The sizes most economical for shelving as given by Henderson (12), based upon the experience of the New York Public Library, cannot be verified; efforts to

find the work sheets pertaining to Henderson's article have so far yielded no results. (114)

Unfortunately, even though the count at both Yale and Brown was extensive, neither can be used to substantiate the other because at Brown periodicals were excluded from the count.

Considering the small percentage of folios, the information coming from Yale and Brown cannot be used with confidence.

The relationship of the degree of shelf adjustability to stack heights has been discussed only by Van Hoesen (11) and this was done sketchily. A detailed demonstration of this point would serve to show how much potential capacity is lost by the rigid American system of adjusting shelves at one-inch intervals no matter what the stack height.

Of the various methods of estimating capacity only Henderson seems to have based his calculations on actual counts. (19) But completely convincing evidence is lacking for Henderson's conclusions. Even so, Henderson made a real contribution by the doubts he cast on estimates of the number of books per linear foot. Estimates of the number of volumes per square foot naturally are no more reliable.

Savings developed by systems of compact shelving must be regarded with suspicion when presented theoretically. In any actual installation the shape of the room and other factors will seriously affect savings. The library profession would benefit from a demonstration of how these factors influence the capacity of each type of compact shelving.

While the Van Hoesen articles (11 and 13) show the gain from partial sizing of books, no convincing evidence is at hand to show the gains resulting from complete sizing. The experience of the New York

Public Library should yield interesting results, but these will not be known for some time. The experience of the New England Deposit Library, where each library chooses its own system of sizing, adds little to our information. (115) Various factors make it very difficult to draw conclusions from the experience of the Midwest Center.

Most elusive is the cost of conventional shelving compared to compact shelving. Obviously, the cost of the building is a prime factor. But what taunts the student of this subject is the proper cost to assign to conventional shelving in a multi-tier installation where added structural strength and stairways and elevators complicate the picture. Muller (39) assigns to conventional shelving the price of 43 cents per volume in a multi-tier building. In a single story building Muller cites a price of 16 cents per volume. Gosnell's (41) cost figure of three dollars per lineal foot is the same as Muller's 43 cents per volume if the assumption is made by the reader that there are seven volumes to the lineal foot. What is needed is a series of cost studies based on actual installations.

B. Effect of Microcopies

Because of the American practice of producing microfilm on reels rather than on strips, no interest has developed in comparing the storage costs of the two. Likewise, studies are lacking showing the comparative cost of storing microcards and reels of film.

To date all studies of microcopy as a method of storage have ignored newspapers as a specific problem. The collection at Columbia which Pritsker (56) studied presumably contained no newspapers, the filming of which involves special problems. The library profession would benefit from a study in which newspaper storage costs were isolated.

The line of investigation opened by Pritsker, in part

based upon Muller (39), ought to be continued. What is needed first is a study similar to Muller's in which a multi-tier structure will be taken as the point of departure. In this structure the cost of storing film should be related to conventional shelving systems as well as to film cabinets. Because the difference between the cost of compact shelving and "normal" shelving is more dramatic in a multi-tier building, special attention should be given to the storage of microcopies in compact systems of shelving.

Esterquest's demonstration (55) of the costs of storing volumes in Iowa City and at the Midwest Center must be approached with care. The cost of a storage building in Iowa City was taken to be 31 cents per volume, a figure which is low enough to excite wonder, considering that this cost is less than five dollars per square foot. If this is the cost of a Quonset Hut, how often would it need to be replaced? The cost of storing a volume in the Midwest Library was based on an estimate of two cents per volume for its entire annual operation. This in turn was based on total capacity, a largely theoretical figure which probably would be revised today to meet actual conditions. In brief, the nature of the collection has affected earlier estimates of capacity.

C. Storage of Non-Book Materials

With respect to non-book materials filed vertically, what is the cost of filing drawers compared to the cost of conventional shelves? And what is the cost of filing drawers compared to the cost of sliding shelves? On these materials there exists no study comparable to the one for books undertaken by Muller (39).

Likewise lacking in the literature is a demonstration of the capacity attained when maps are stored vertically compared to maps stored in drawers horizontally. In this phase of the art of storage, so strong is the feeling against vertical shelving (it is deemed inconvenient)

that no study is likely to alter existing practice.

In the libraries where the map collection is large enough to warrant serious study of storage systems, the question arises whether maps should be stored horizontally in shelves or in drawers. In most libraries drawers are employed, but this may simply reflect the feeling among librarians that the magnitude of the problem is not sufficient to require a change. Yet at the Library of Congress maps by choice are stored in drawers, while the Bibliothèque Nationale prefers shelves on which are filed map portfolios. True, the French library's method may be considered inconvenient except for little used materials. But assuming two large collections of maps used in the same manner, which system produces the more economical storage? On this question there is a gap in the literature. This brings to mind Ristow's comment (116) that few map libraries are located in quarters planned originally for maps, and that map librarians have in general not realized the opportunity to study ideal accommodations.

Of the various targets for research mentioned above, the following are deemed most important:

1. With regard to the cost of compact shelving compared to the cost of conventional shelving, we need figures based on actual bids.

2. With regard to oversize books we need to know more about their number in relation to the entire collection in several large libraries, and we need to know in the light of this information how we can shelve these most economically.

3. In the matter of the storage of books we know that microfilming results in no savings. However, we need a study to demonstrate whether savings can be effected through microfilming in the storage of newspapers.

4. We need to know what is the most economic method of storage for microfilm and other micro-copies. We need to study whether microfilm on reels does not result in wasteful storage.

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Volume Three Part Three

Storage Warehouses

by

Jerrold Orne

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Storage Warehouses

It is manifestly impossible to approach any single aspect of cooperative library effort without at least passing reference to the mass of literature gathered under the ample umbrella of Cooperation. The bibliographical survey of John Rather (1) provides thorough documentation of most fields of cooperation up to 1955. Few additional references are needed to bring the listings up-to-date. In fact, in reviewing the literature, one is swiftly impressed by the constant recurrence of ideas conceived and expressed at very early dates in our library history. The essay of Downs (2) in the printed report of the Monticello Conference of 1955, when combined with other discussion reports provides a cogent statement of Cooperation as we know it today. The problems are timeworn and well known to all; solutions have been discussed for decades, with little progress made in practice. A few fields have made greater advances than others with signal, if not lasting, success. In technical processing, for example, the early production of printed catalog cards and their distribution has been an undeniable success. In acquisitions, the Farmington Plan has had only partial success at best. In spelling out resources, the development of the Union Catalog idea can certainly be credited with considerable success. Public service, in its normal growth, has developed cooperative plans on the local, state, and national level. Interlibrary loans and the free flow of materials where needed are hallmarks of our library systems.

It is in the area of acquiring and organizing our material resources that the gravest problems not only continue but steadily increase as world production of the printed word grows. The difficulties of keeping up

with the sum of knowledge expressed in printed form are not the first concern of this study, but problems of storage are so inter-related with those of acquisition that they can hardly be considered separately. In any case, solutions proposed and targets for research must involve both.

The scope of our consideration of deposit and storage libraries here will be limited to the philosophical or rational and, to a certain degree, the physical aspects of storage and deposit libraries. We are not concerned primarily with the library's contents although they provide the "raison d'être" and create the need for something other than standard library storage. We do not take up the equipment or equipping of storage buildings since this will be reported elsewhere and constitutes in itself a fairly complicated problem. The study will not consider storage planning in foreign libraries since their bases of operation are not comparable to ours and massive collections creating a need for storage are much less common abroad than in our country.

This study will be concerned with any factors compelling or contributing to the compelling need for storage facilities in any type of library and for any character of collection. It is inevitable that acquisition policies and collection programs must be given some consideration since they, in so great a measure, determine the need for extended storing areas. An effort will be made to isolate that part of theory of cooperation which affects massive growth of collections and to concentrate our attention on the physical entities which are storage libraries rather than their reason for being. In order to cover the field, it may be most convenient to move from the smallest to the largest, particularly since this falls into a logical pattern of going from the libraries least involved to those most involved.

Small public libraries in general have no storage problem of a size to be concerned with separate or

cooperative storage libraries. They are chiefly concerned with getting enough books to serve their public and keeping them in operating useful condition. By the time any book is ready for storage in their collections, it is either completely worn out or so out-of-date that it need only be discarded. The financing of small public libraries in our country today is not often good enough to enable them to purchase extensively beyond currently useful books. On the few occasions when a small public library receives a gift collection of consequence but not very useful for its daily work, this collection becomes an object of local historic or public relations importance and is in no sense a candidate for storage. It is an object which requires publicizing, but this is a problem of cooperative information rather than storage.

Among the small college libraries, the measure of size and circumstance is similar. In very few cases does any small college library grow to such a size as to require consideration of a storage library. In equally few cases does the typical college library acquire any notable collections or works which affect considerations of storage. They do receive, and almost all the college libraries will have, one or more special collections, either regional or particular, where relatively rare items are occasionally found. These, as in the small public libraries, need to be reported centrally for information, but there is little need for physical relocation; in general, the small college library is not involved in the storage problem.

Another type of library which should be considered is the special library. These are either commercial, industrial or government libraries, each having a specific field or a narrow range of subject content. The very limited nature of their subject interest automatically relieves them of storage problems. Further, such libraries have an even more narrow chronological range of interest, in some cases as little as five years for current materials, with minimal interest in retrospec-

tive publications. Accordingly, there is no consideration of storage libraries; older materials are discarded or given away and the permanent part of the collection continues to be small.

Logical reasons for the storage idea begin to become apparent in the medium-sized public library. Such a library has a larger constituency and funding and consequently more complex needs. In addition to these two factors, it is with this size that the third, ambition, begins to make itself felt. The public library which serves a city of 100,000 or more requires a fairly large collection. The range of its contents is considerable and must have more depth than does that of a small public library. To serve such a population, the library must be prepared for a great variety of users, of backgrounds in its patrons, and for levels of social and intellectual life whose needs are distinctly more complex than those of a small community. Also, the support of a library by such a population normally will bring to it possibilities of growth, either through routine appropriation or by special gift, sufficient to make it inevitable that an accelerated rate of expansion takes hold of the institution. Also inevitably, serious problems of space develop. From the foregoing, one might presume that the library is a passive agency whose activities are determined solely by the number and character of the population it serves and the extent and quality of its funding. Even if this were true, the growth of such a library often attracts one or more librarians who become personally involved in direct proportion to the extent of their own personal integration in their community until their own ambitions for growth and development become inseparable from the goals of library service.

In college libraries, there is also an intermediate level quite comparable to the middle-sized public library from this point of view, the chief difference being in its constituency. In their case, the public consists primarily of students and faculty, with some small

consideration being given to an administrative group. In some instances, the local community has also to be considered for extended service. In these colleges the size of the student body and the variety of educational programs offered immediately establish the need for general collections. The number and relative qualities of facilities provided determine in considerable measure the extent to which the collections tend to grow beyond what is common to all college libraries of comparable size. In this case, personal or corporate ambition may become a major factor which tends to skew a library's collection in one or a number of directions beyond all reason. Here, also, the ambitions of an administration may lead the college library far beyond the point of actual need and thus affect this type of library's consideration of storage areas.

Among the special libraries there are a great many which attain a middle level, in modern times, especially in the fields of science and technology. Many of these libraries are founded by private enterprise, and freedom of reduction by discard or reassignment prevents the medium-sized special library from being involved in overwhelming growth of collections. In this class there are a multitude of industrial, commercial and privately endowed research libraries. This group also includes many government libraries. In the latter case reduction is not simple.

The storage library idea has attained its fullest development in the areas of the major public, academic and special libraries. Every critical consideration of the storage idea has evolved primarily from problems of size. It follows normally then that the largest units are the most heavily involved. In fact, one might almost designate the need for a depository as a standard hallmark of attainment of size. Among the public libraries the literature reveals only a few attacks upon the problem of storage by major public libraries. The public libraries of Providence, Denver and Boston may be cited as leading examples. An extension of public

library problems is found in reports on activities of some state libraries or statewode groups of librarians in Indiana, California and New Jersey. Their considerations are concerned on the one hand with providing central depositories to serve better a multitude of smaller units and on the other with attaining bibliographic control of a given state or region in order better to serve on a national scale. This will be taken up in greater detail in the discussion of regional depositories. Major examples of the storage idea among the academic libraries will include individual library solutions as well as joint or cooperative centers. The literature reveals few cases but reasonable variety among them. DePauw University, Iowa State College, the University of Michigan, the Hampshire Interlibrary Center, the Midwest Interlibrary Center, and the New England Deposit Library comprise the field. In addition to the statewode plans briefly mentioned above, other examples of deposit and storage activities can be found on a very large scale in the federal government. Problems met by the Armed Forces Medical Library and the Library of Congress will serve to illustrate this point. Each of these has some bearing upon the growth and development of the idea of depository or storage libraries. When properly combined with considerations of the growth of collections and the availability of cooperative resources, it may be possible to establish a logical pattern for the development of deposit or storage libraries in our country.

Among the public libraries, and in terms of serving the general public of a given community or collection of communities, it is commonly recognized that the small public library in our country while it is often a well-funded, firmly established and thoroughly accepted way of life, does not grow beyond the needs of its community or attain any great size. When the community involved is fairly large and its library correspondingly more complex, the possibility arises that an increasing proportion of the contents of this library is little used. One should expect this since size normally

comes with age and with age libraries tend to hold a larger proportion of out-of-date or historical materials. Together with age and size one finds an increasingly complex system and greater difficulty in maintaining all materials and all services to all people. All of these factors can be seen behind the effort of the Providence Public Library to meet its space needs thirty years ago. (3) At that time a medium-sized library growing into a large library with a collection already including many little-used volumes, the library acquired an old church building at some distance from the central library where it placed in active storage a sizeable number of little-used newspapers, journals and books. There is nothing extraordinary about this effort. It is one of few recorded in our literature and represents one example of what any library of its kind and size has inevitably to do under our present philosophy of librarianship. On a somewhat larger scale, the Denver Public Library some twenty years ago, in the face of impossible space difficulties, sought to resolve its needs by going outside of its building.

Late in 1949 the City of Denver acquired a very large warehousing area originally built for military use. The Denver Public Library requested and was allocated a large area into which it planned to move its Division for Work with the Blind and a regional depository library. Before planning could be completed, the military arm reached out to reclaim its buildings, and the project died. This was followed by more planning and committee work in an effort to establish some form of deposit library; the academic institutions nearby participated in these discussions, led by Dr. Wyer. Among the early responsibilities of this committee were 1. seeking financial support for the idea, and 2. determining the categories of items to be placed in the depository.

In an early Memorandum (4) concerning the storage facility, an effort was made to link its development with the Denver Bibliographical Center for Research,

and efforts were made to stabilize planning on the basis of an available facility. This left only the necessity for equipping and manning to be met. With the withdrawal of the building a new Memorandum (5) was prepared presenting the case for storage together with a long-range proposal. This proposal was for a new building, quite small but yet large enough to contain a small branch library, a large working area for the Division for Work with the Blind, but less than 5,000 square feet for conventional stack storage. With the funding and construction of the new Public Library building, all activity concerned with storage space came to a halt. However, Mr. John Eastlick anticipates a similar need at another time, and his final paragraph acknowledges no defeat, but a truce:

> The need for a depository library in this region has not decreased. Rather, it has become more acute. We have a natural framework in our Bibliographical Center for Research to establish such a facility. Some day I hope that we will be able to proceed again along these lines.(6)

As mentioned above briefly, there have been a number of state library agencies or association groups which have concerned themselves with the organization of statewide cooperative planning both in building collections and storage. (7) Some of these plans have gone to the point of enabling legislation. In New Jersey laws were passed in 1949 authorizing the State Library to receive books and other library materials from other libraries and to store them in a central location. (8) There has been no great expansion of this idea since the State did not provide funds for the building space to house any sizeable cooperative collection. Approximately the same situation exists in Indiana. There, too, the idea of establishing an archives and central repository has been actively promoted by the Indiana Library Association and the Indiana Library Trustees Association since early 1952. In this case, the enabling legis-

lation has not been passed since it is directly tied to a sizeable building plan. The proposal still has strong support within the State, and the State Library has every intention of pursuing the goal until it is won. (9) Their plan includes the general ideas of building a central repository for all libraries within the State together with reduction of duplicates just as in New Jersey. California has recently demonstrated an active interest in regional cooperation and also, as early as 1952, did some research on the interest of California libraries in this matter. In that State also the State Library has been the agency most actively concerned. No concrete results have been reported. In Connecticut there is an active interest, and the Bureau of Libraries is making plans for central and regional storage of little-used books from the public libraries. There, too, space is at a premium and no marked progress has been made. Michigan has reported active interest in this field. The State Library has been designated as a central repository in the planning of the Michigan libraries. In New York the State Library agency serves as a central depository and distribution center for all public libraries of the State. This function has been in the program of the New York State Library for a long time and the central question there is not of initiating a new system but of extending an already fairly sizeable enterprise.

It appears to be generally accepted and understood that the materials found in public libraries, with the sole exception of the very largest, normally include a large percentage of little-used materials. Also, considering the characteristics of their public, most of these little-used materials can be stored at a distance without seriously prejudicing the service potential of any given library. On the other hand, the existence of a central repository containing a large collection of little-used materials extracted from numerous different libraries automatically creates a much larger central resource than any individual library can otherwise command. It is evident that these few ideas and many

others which are presented by the proponents of storage libraries, have been understood and seemed important to a large number of statewide library activities. The pattern for organizing a central deposit library, together with a service center in any state, appears to have become fairly standardized. More often than not, the State Library is the chosen agency. Any library within a state may elect to deposit its little-used books at one point with the entire collection being serviced by some central bibliographic activity. The fundamental stumbling blocks to such plans have been and remain: first, certain legal requirements, and, second, the funding of the central enterprise. Up to the date of this writing, no state central deposit library has yet attained full development of the normally extensive plans announced by a number of states of our country.

In a recent conference on Cooperation, Dr. Robert Leigh summarized the present state of progress, making some comparisons of public and academic libraries:

> Thus far we have been talking about public library development. Among college, university, and research libraries there is appearing a similar change of emphasis away from libraries as self-contained units with services bound to the resources available in their own plant, to the academic library as a point of direct service to students and scholars using all the materials and personnel available from all possible sources. The shift of focus has been accelerated greatly by the problems of acquisition, storage, organization, and availability of the increasing flood of printed and other materials needed for scholarly work. There is an increasing appreciation of the fact that library materials are growing by geometric progression while library funds, staff, and shelving, at best, lumber along by arithmetic progression. Perpetual growth therefore is no

longer seen to be a law of the academic library's nature. That libraries give better service as they grow ever larger is being called into question; there is increasing realization that no university can hope to acquire and house all the materials its faculty needs to use. College, university, and research libraries are coming slowly to regard themselves as interdependent institutions.

Under this newer philosophy, machinery of interlibrary cooperation on the university and research level is being planned, discussed, and in some cases, put into practice. There is the national union catalog, and cooperative cataloging. There are regional bibliographic centers with union catalogs used for facilitating interlibrary loans and aiding in the regional storage of last copies of little-used volumes. There are regional storage and acquisition centers for less-used materials. There is the Farmington Plan with its extensive interlibrary agreement for specialization in collections. There are interlibrary arrangements for microfilming newspapers and inaccessible, valuable materials, and the general use of microfilming as a substitute for the more cumbersome interlibrary loan of books.

In the light of the task of making the world's resources of valuable materials available to the students and scholars who need them, these steps in interlibrary cooperation are only beginnings. As in the public library field, there are barriers to any rapid development of the new machinery. Political opposition and public inertia are not delaying factors. But there is academic opposition. College professors, despite what the Red hunters say of them, are essentially conservative people. They do not want to let any books or serials that they or their students might conceiv-

> ably use, get out of their sight. There are librarians in colleges and universities who have a similarly proprietary attitude toward all the material that comes under their custodianship. And few indeed are the university administrators who accept the notion that any field of learning should be assigned permanently to a sister institution, along with the major responsibility for maintaining the library collections in that field.
>
> Yet interlibrary cooperation in one or another aspect is entering a stage of significant experiment in the university and research library field. It is well that there is as yet no master plan or single accepted formula for its development. What particular type of cooperative machinery is good for one stage or region may not be appropriate for another. As in the case of public libraries, it is likely that the structure of interlibrary cooperation that emerges from the present period of trial and experimentation will be complex and various rather than neat and uniform. (10)

Some of the earliest considerations of storage libraries grew out of a crowded library situation at Harvard University at the turn of the century. Both the Librarian, W. C. Lane, (11) and the President, C. W. Eliot (12) were swiftly embroiled in a profession-wide brawl, precipitated by the designation of some books as "dead." The contention diverted useful energies entirely from calm consideration of the storage need for at least a decade. There was another flurry ten years later when Andrew Carnegie, (13) H. L. Koopman, (14) and others again approached the tender subject of definition of books "not in use." The World War then came to fill all minds with more pressing matters, and the whole subject of storage libraries rested virtually undisturbed until the massive expansion of printing beginning early in the forties focussed new eyes on the matter. In our library economy, as it

happened, the libraries of great size, with few exceptions, were chiefly academic. It was quite natural, therefore, that a few major educational institutions should take the lead in planning for storage.

Before considering the truly cooperative plans initiated by academic librarians or administrations, it should be mentioned that there have been individual library solutions to storage problems developed within numerous small, medium-sized and even large individual academic libraries. Although the literature reports few instances for the smaller and medium-sized libraries, there have been scores of cases where the growth of a small collection, even in the more modest institutions, has led to book storage in basements, attics and classrooms, usually leading inevitably to the building of a larger library. It may be useful to cite a few examples recorded in the literature.

In 1945 the DePauw University Library was compelled to seek storage space outside of its building for a book collection which outgrew the library's space. (15) A very careful selection of books was made in order to choose those for which the smallest demand would be made. A survey was made after two and one-half years of separate collections; out of 11,500 books stored, only 260 volumes were called for over the two and one-half year period, and only 10 books were returned to the library for active use. This suggests that even in a relatively small institution a fairly sizeable number of books may be classified as little-used. It also indicates that it is possible to separate out those for which there will be little demand with a high degree of accuracy.

A second instance of an individual academic storage plan was that of Iowa State College. (16) In this case, a separate building at a distance from the library was constructed specifically for the purpose of providing cheap storage for library materials. The building was completed and occupied by September, 1940. It was

designed to store about 70,000 volumes carefully selected for minimum use. The collection consisted of little-used monographs and early runs of scientific and technical periodicals. The building has been in continuous use since 1940. The first ten years of its service was reported with every indication of a successful demonstration of cheap local storage for books. (17) The present administration is convinced that this library provides for their purposes many of the answers to problems of book storage. The librarian reports,

> The library storage building has not been enlarged, but an addition will have to be constructed to it if we continue to fail to obtain funds for an addition to the main library storage building... We have no intention of ever abandoning the storage building in the foreseeable future. (18)

The most recent and largest storage library for a single institution is the one which opened at the University of Michigan in February, 1956. The building was designed solely for book storage, using compact drawer-type stacks. It has four floors, each of which has a capacity of 100,000 volumes. The books are shelved in fixed locations, essentially by size. It is simple and functional, windowless, air conditioned, with temperature and humidity controlled. The distance involved is two and a half miles. The contents were, of course, selected for minimal use, yet a once-daily delivery averages 75 volumes recalled for use. Muller's comments on the utility of the building are quite similar to those of Robert Orr at Iowa State. They have not experienced any adverse criticism because of the distance, loss of time, or relative unavailability. Their experience confirms the concept of little use for a considerable number of books. Michigan now has more than 200,000 volumes in the storage building.

The above three examples are only illustrations of the tenor of thought and the stage of development the storage idea holds in some academic institutions. In

fact, the same may be said for virtually all except a very few, very large universities. The few publicized individual storage plans, when added to the multitude of devices we have all seen in use throughout the academic world, confirm the preponderance of individual, not cooperative, solutions up to the present time. Almost any one of the librarians or administrators concerned will grant that his present solution is only a temporary one, but so far no one is willing to accept what has been done by cooperative effort as the final or best solution.

We do have one outstanding example of a cooperative plan which, on a small scale and involving a limited number of institutions, does accomplish some of the goals so frequently alleged for cooperative enterprise. The Hampshire Interlibrary Center (19) was established at the end of 1951 as a joint enterprise of Amherst, Smith and Mt. Holyoke. Although other institutions may elect membership, these three comprise the originators and continuing active participants. In this enterprise there are three cooperating colleges within a five mile radius. Each is a fairly sizeable and mature institution having sufficient support to develop collections beyond current use. Actually, the combined collections of the three institutions amount to 875,000 volumes, a number larger than that available in many large universities. In fact, if the contents of the collections were combined, the problems raised would be almost precisely those of the typical large university library of today. Since one of the institutions, Mt. Holyoke, had available space, this cooperative effort had no building problem. It did have the somewhat lesser problems of selection, equipping and personnel. With the aid of a foundation the enterprise got off to a good start; being of limited size, there was ample time for careful and thoughtful selection. There was also time for mature consideration of some of the other goals of cooperative library effort with the result that here, in fact, the possibilities of reducing unnecessary duplication, truly disposing of duplicates, and actually

combining acquisition programs for serials with joint use of existing titles, have all been successfully carried out. Each annual report of this Center (20) reveals increased extension of the number of serial titles made available by reduction of duplication within the three libraries. Each year some additional materials representing duplications are sold and joint purchases of materials otherwise beyond the individual means of each institution are reported. After some five years of operation, a survey of the Hampshire Interlibrary Center by Mr. Keyes Metcalf was financed by the Fund for Advancement of Education. (21) In one of his most recent statements of the philosophy current in this field, Mr. Metcalf lists the four major fields of interlibrary cooperation as use, acquisition, cataloging and storage. (22) He goes on to state that "the Center is concerned with all four of these cooperative activities." In this case, it is possible to verify these points. Although a cooperative storage center, these materials are in use, naturally most heavily by the Mt. Holyoke staff where the library is located. The principal point, that joint use of resources is possible, is certainly demonstrated here. Any one of the institutions has complete access to all of the materials stored. The number of items called for in the latest report, 722 items in one year, is quite small. However, this only confirms and again repeats the experience cited at DePauw where minimal use indicated a very careful selection of books sent to storage so that small numerical use is the norm. Mr. Metcalf anticipates the question of costs by a statistical device using the size of the collections stored as a major factor. According to his calculations, a use factor of three volumes per working day is tied closely to the size of the collections stored in percentage of use to number of volumes. He declares that if the collection were as large as one of the participating libraries, it would then circulate 100 volumes per day and, if multiplied to the size of Harvard Library, would circulate 1800 volumes a day.

In its acquisition program, the Hampshire Inter-

library Center has accomplished, on a small scale, what many aspire to on a national and international scale. Departing from the basic requirement that a college has to maintain an operating collection capable of supporting all of the ongoing programs of its institution to the fullest extent of available financial resources, the three libraries have carefully compiled lists of journals held in common and measured them against frequency of use to determine where one copy might serve the needs of all three if cooperatively held. Many serials titles have been reduced and duplications eliminated; with the funds thus freed, additional useful titles have been acquired for central distribution and storage, thus making far more journals available to each institution than before.

In the area of cataloging, less has been accomplished than in any other. Since the bulk of the resources stored in this Center comprises serial sets, there has been no great volume of cataloging effort required by any one of the contributing libraries. There have been economies resulting from reduced costs for binding and in the reduction of number of places cataloging is required, but no major advance can be cited in this area. Neither can any great claims be made in the matter of physical storage. The materials stored have been placed on standard library stacks in standard library space using an existing physical facility. The size of the collections stored is still sufficiently small so that any consideration of space used, present or proposed for the future, contemplates using space in existing buildings at some institution of the area. In effect, the Hampshire Interlibrary Center is a relatively small enterprise, organized within narrow limits of geographical area and member institutions. Within these limits it has been possible to experiment to the very considerable advantage of each of the institutions involved in terms of both costs and resources. The problems become infinitely more difficult and cannot hold the same pattern when the cooperating institutions are many, large, and varied and when the geographic area is

multiplied ten times or a hundred times over.

Also in a small geographic area the construction of the New England Deposit Library marked the final step in the evolution of another type of regional cooperative effort in Boston.

An early account of the development of the New England Deposit Library (23) alludes to the turn of the century statements of President Eliot and the controversy over "dead books" (24) and traces the development of the idea into a structure. It cites the survey report in late 1940 and Fall's "Proposal" of December, 1941. (25) Fall's summary cites the following gains or advantages for a deposit library:

1. Economy in building costs; savings for future building.
2. Economy in cleaning, heating, lighting of book storage areas.
3. Reduces need for shifting and wear on books.
4. Economy in use of shelf space.
5. Elimination of unnecessary duplication.
6. Cooperative cataloging.
7. Cooperative acquisition.
8. Better protection against heat, light, dust, and fire.

The New England Deposit Library opened its doors on March 2, 1942, (26) and Metcalf's first post-building statement of advantages (27) includes many of those listed by Fall:

1. Cheap storage.
2. Elimination of unnecessary duplication of the past.
3. Prevent unnecessary duplication in the future.
4. Provide for disposal of unnecessary duplicates.
5. Help establish division of fields in research library.
6. Make readily available to all the little used

books of any.

Another general account (28) of early use and problems encountered by this Deposit Library adds some details of management, but nothing to the basic goals. Some of the technical aspects of processing involved in storage of library materials are discussed at some length by Leupp (29) and Osborn. (30) The fullest treatment of the development and first five years of operation is found in Doherty. (31) He first outlines the early ideas which led to the Deposit Library, quickly sketches in the history of the movement in Europe as well as this country and moves into storage library theory. (32) His list of advantages duplicates essentially those already cited. In his second article, (33) after reporting on many administrative details of operations in this library, he writes, "However, beyond the storing books, the Deposit Library has accomplished little. It has made no inroads toward the elimination of duplication or toward increasing library specialization." (34) Mr. Metcalf's reporting after thirteen years of use provides many facts and figures as well as data concerning actual use. One positive gain lies in the statement, "Though it has saved money, the New England Deposit Library could hardly be considered successful if it had not also demonstrated that the inconvenience entailed in storing books at a distance from the main collection is not an unbearable burden on scholars." (35) This same article confesses that nothing has been accomplished in the elimination of duplicates, and that no effect on coordination of acquisition can be claimed for this institution.

It seems clear from these selected references and the multitude of lesser allusions in more general articles that the New England Deposit Library has provided essentially one basic advantage, that is, cheap storage. Other advantages claimed, such as economy of heat, light, dust and fire safety would cost the same if materials were stored in the same type of space in any building, with the only real difference possible in the

cost of land. This library has not and appears likely not to accomplish any of the cooperative goals proclaimed earlier by its proponents. There is, in fact, no gain for cooperation here. Each library rents its space, holds ownership and responsibility for its own materials. Cooperative use, extremely infrequent, offers no more than is now commonly obtained elsewhere by Interlibrary Loan.

The period of 1945-50 was a time of increasing pressure on libraries of all types for housing and funding. Consideration of cooperative plans was the order of the day. In the East research and academic librarians and institutional representatives initiated a series of meetings early in 1948, prompted by the major Foundations, seeking to resolve some of the current growth problems of libraries in that region. (36) The second meeting, comprising chiefly librarians of the New York City area, heard Mr. Archibald MacLeish theorize on cooperation. (37) There were no concrete results from these first two meetings, unless the determination to continue to seek means of cooperation can be so defined. This determination culminated in a proposal for a regional library by Keyes Metcalf early in 1950. (38) The Metcalf proposal was regional in scope, naming the Library of Congress, the University of Pennsylvania, Princeton University, Columbia University, New York Public Library, Yale University, and Harvard University as the principal institutions concerned. Discussion of this proposal proceeded with Carl White and John Fall each documenting the thinking of the New York group. Fall's committee report summarizes clearly the state of thought up to that time. (39) The next year or more of discussion led to a decision by the trustees of four major institutions (Harvard, Yale, Columbia, New York Public Library) to ask the firm of Cresap, McCormick and Paget to make a study of the problem and to submit its recommendations. This action was taken then, following some five years of meetings, discussion, and debate by the leading librarians of the

Northeastern area. By this time the issues had resolved themselves fundamentally into two camps, with Metcalf, Babb and others proposing a regional library, and White, Beals and Fall favoring a metropolitan New York cooperative depository. Also, in the distance were heard rumblings from the Library of Congress, where Luther Evans asserted that the Farmington Plan extended plus subject specialization agreements would resolve space problems and others.

The preliminary review provided by the management consultants (40) provides a graphic summary of considerations to that date, an outline of directions for further investigation, and the fundamental statement of the enormous magnitude of research needed to answer the questions. Its major recommendation was that a sum of $150,000 be sought to finance these further investigations. This preliminary review apparently laid all ghosts, since following it the matter quietly disappeared from view. In the very recent past the New York Public Library has resorted to size shelving (41) as a partial solution for its particular space problem. The idea of a Northeast regional library now appears to be moribund, if not dead.

The most extensive and widely publicized venture in cooperative storage up to this time is the Midwest Interlibrary Center. The Center is a creature of the inventive imagination found among a number of prominent academic administrators and librarians. The initiative was taken by Colwell and Fussler at Chicago, Ellsworth at Iowa, and McDiarmid at Minnesota. (42) The Carnegie Corporation provided most of the money to launch the enterprise ($750,000) and the Rockefeller Foundation added $250,000 to provide an initial capital of one million dollars.

The building which houses the Midwest Interlibrary Center was completed in 1951 at a cost of approximately $780,000. It is located on the campus of the University of Chicago. The building is designed essen-

tially as a storage warehouse for books with a minimum of space provided for public service and staff. Its capacity is reported to approach 3,000,000 volumes. (43)

The initial group of institutions participating in the Center numbered ten, including chiefly the major university libraries of eight middle-western states. Other institutions have since joined until the corporation now has eighteen participating institutions. The initial financing of the library's operations was based in part upon the two grants of foundations and a formula for charges against each participating institution based upon a number of factors including the institution's book budget, its graduate programs and its proximity to Chicago. In its first year of operation, the operating budget of the Center was established at $12,000. The same item in 1956-57 amounted to $90,856.45. (44) In the initial plans each participating institution was to receive a catalog which would provide access to bibliographic information concerning all materials deposited in the library. In addition a teletype system was inaugurated to provide speedy communication between the members and the Center. One of the major advances claimed for the cooperative deposit was the possibility of reducing duplication of materials with consequent savings in space and acquisitions costs. A certain amount of success has been attained in this endeavor, particularly in types of materials such as state documents and foreign dissertations. Another major program at the Center is a positive acquisitions plan designed to bring into the Center only one copy of certain types of publications which will then serve all members equally and relieve them of the necessity for purchasing. Each member now contributes in some measure in this acquisitions program, but to the present time, it has not attained any great size. In two areas, foreign newspapers and chemical journals, the Center has been able to purchase fairly extensively to improve the overall resources of the region by assuring single copy availability to any member.

In the latest report of the Midwest Interlibrary Center, the Director summarizes six years of operations by the statement that, "At least one important measure has been accomplished: member libraries have been relieved of congestion in their book stacks to the tune of more than 1,000,000 volumes..." (45) He also confesses that the acquisitions program, its second mission, represents somewhat less progress. It is clear from what is said and not said in this report that there has been sufficient reluctance on the part of its members to the expansion of the Center's program to prevent it from being very much more than rental depository for little-used materials.

As stated above, the literature on the Midwest Interlibrary Center is voluminous, beginning with the first concrete statements of the need and the plan. From the documents which led to the funding and establishment of the Center, through numerous reports of progress, every step of the path traveled by this agency has been thoroughly documented. Interest in the actual practices, as well as in the aims of the institution, has been intense throughout the past ten years. There can be no doubt that planning for the work and program of this institution has precipitated a large number of ancillary studies by specialized groups, on the one hand medical and legal librarians and on the other technical processing personnel in other fields. Public libraries, state libraries and the smaller academic libraries have all been intrigued by reports of the Center's activities and have carefully studied the application of its practices in their particular field. It may be certainly said that no single activity has contributed as much overall to the impulse given cooperative planning as this one. Whether it be judged successful or not, its importance in guiding the thinking of modern libraries toward the future has been considerable. In addition to this, the experience of ten years and its application to oncoming problems may provide us with answers which might otherwise have been impossible. The experience of the Midwest Inter-

library Center and the documentation of the proposed Northeastern depository provides a great many of the essential facts needed to make plans for the future.

No picture attempting to portray the development of the storage or deposit idea would be complete without some representation of the great special libraries found in Washington and their past and current problems. At least two major storage problems can be shown to demonstrate quite different types of problems and solutions.

In the first instance the motive was not need for more storage space, but need for more secure storage in wartime. Early in 1941 Mr. Archibald MacLeish became very concerned(46) lest much of the irreplaceable portion of the Library of Congress's collections might be destroyed by enemy attack. First consideration was given to bomb-proof shelter, dead storage, in the mountains of nearby Maryland. Fortunately, for U.S. finances, more mature thought led to a relatively painless and inexpensive series of depositories in existing libraries at a number of isolated but readily accessible locations. The thousands of books moved out of Washington for the duration(47) were as completely available as the nearest telephone. At the end of the war the collections were returned to Washington without untoward incident. This example is cited chiefly to suggest that all libraries are not always completely filled.

In this same period yet another type of problem faced the Army Medical Library, now known as the National Library of Medicine. Crowded and miserably housed for decades, the situation in wartime made the danger to the old and rare collections of this great library an extremely grave problem. In July of 1942 a junior member of the staff was sent to set up a part of the AML collections in rental space at the Allen Memorial Medical Library in Cleveland. (48) All books published before 1800 were destined for the new depos-

itory, now the History of Medicine Division. This installation was not intended as a dead storage center; its materials have been in continuous active use since their installation, are fully cataloged, maintained and served when needed. Although this installation continues currently in the same space today, it will doubtless return to join its more modern counterparts of the 19th and 20th centuries in the new building this national resource will soon build. In this instance, the storage motivation was both space and preservation; again the depository was at a very considerable distance. There are parallels or similarities to factors inherent in both the academic and public problems. The materials are of the "little-use" class. Preservation of unique copies is involved. Service at a distance and a time lag are present. Pressures of modern acquisition were compressing available space ever more. In short, the fundamental motivation toward deposit or storage libraries is basically the same in virtually every type of library we have discussed.

It is evident from the foregoing passing in review of a wide range of levels and types of library enterprises in the field of storage that the profession has striven manfully to cope with an ever-increasing flood tide of library materials. Yet we remain with the uneasy feeling that the whole thing has not come off, that such solutions as we have found to the present time are not within shouting distance of adequate. Robert Downs, in a recent article on library cooperation (49) spells out a number of pros and cons for certain cooperative efforts, but has no panacea to offer. His plea is for the use of the scientific approach. He believes that we now have "an increasing number of leaders in our profession trained in research methods and experimental techniques," and goes on to say, "Let's start applying these criteria to plans for library cooperation, as well as to every other phase of professional librarianship. In other words, I am proposing that we use our heads rather than our hearts. This is the way to achieve a true profession." (50) With this admonition

before us, perhaps we can expose the past record to thorough examination and find some useful guidance in what remains.

We first considered the public library. There is ample material in the record to demonstrate that the needs of the typical public library for storage are not the same as those of the monumental public, academic, or research libraries. The public libraries have made considerable progress in theory, if not in practice, and their part of the solution has been fairly well documented. For the most part, public libraries would be amply served by the establishment of statewide or occasionally regional depositories into which they could pour all of their little-used materials, to be weeded down to a single copy basis available to all comers. Each public library would then maintain a proper level of operating collection to serve its constituency and might thus change in size only as its constituency and their needs grew. In many cases libraries of optimum size could result, with older and little needed books leaving by the back door in the same numbers as new and more live books entered the front. The exceptions to this rule among the public libraries would be the great old libraries of our principal cities whose collections must now be classed as research collections. These libraries might serve as a central depository or join resources with neighboring academic or private research libraries. The other alternative, using the State Library Agency as the central depository is the more usual approach in planning for this segment of our library economy. Let us bear in mind chiefly that each state, or group of states, has a fundamental responsibility for its own residents.

The small colleges and lesser universities (if there are any who will admit of this), almost in the same manner as their public library counterparts have a basic and standard set of needed resources which are common to all, fairly modest in extent, relatively slow to change. Again, it is quite possible to envisage an

optimum size for the majority of such institutions, with stability attained by channeling the older and little-used materials out in numbers comparable to those of the new books entering the collection. The college library's discards might be combined with the public library's in a nearby depository, except in unusual cases where national uniqueness may be in question. Special libraries, which are predominantly narrowly specialized by subject, are not concerned with problems of storage. Bibliographic co-ordination is the ultimate goal for them.

From a purely negative point of view, many types of libraries listed immediately above could do as well by destroying everything rejected as any other way. On the positive side, relegating all secondary materials to selective storage automatically assures the development of a total resource, slightly less available to be sure, but still available, beyond the fondest dreams of acquisitive librarian-types. Purely analytical consideration of the financial potential of these smaller libraries allows no illusions concerning their capacity for supporting, even in a small way, the establishment and/or maintenance of a state or regional depository.

The approach to major public, research and academic libraries on the subject of size and storage is quite another matter. Scholars and researchers, whether in our major public, academic or research libraries are notoriously demanding and exigent; administrators of such institutions or their own administrations may be inordinately and unthinkingly ambitious; and the range of interests is as broad as life and changes like a kaleidoscope with each new twist. How then, can a library's activities be fixed long enough to determine what is needed, or should one seek to fix them at any time? The library must be ever responsive to current needs and its success is measured in direct proportion to its swift responsiveness. What we have then, when analyzed, is a type of institution which cannot be fixed or stable, one which can operate best when it is most

free of trammeling anachronisms in materials, collections, or even services. On the other hand we have institutions whose current needs far exceed their capacity to acquire, organize and serve. We must therefore seek solutions for both elimination and addition, bearing always in mind the unspoken mandate to never reduce out any last copy of a potentially useful item.

The devices reported on here, even to the most highly developed, fall far short of attaining ultimate goals. We have had only a few partial efforts to resolve the growth problems, both in acquisition and in reduction. We do not have universal acceptance of what we have; on the contrary, we have to aggressively and studiously fight to continue even that. It seems that we must look elsewhere for solutions.

Much earlier in this study it was stated that acquisitions planning and storage planning could not be considered separately. It seems now even more accurate to say that any solutions to the problems of storage must consider input as well as output from our libraries. It also seems evident that certain elements of our present library philosophy are no longer tenable, and some of these are the very elements which have prevented earlier cooperative planning from attaining any durable progress. Two particular ideas require close and analytic examination before we can accomplish much in the two areas of our main interest. The first of these is the concept of responsibility for complete, global coverage and where it lies. The second is the concept of library property.

There are at least three and possibly five major libraries of this country which tacitly accept national responsibility for providing anything requested and which maintain library facilities to do this. These are, in order of decreasing readiness to publicly acknowledge this responsibility, the Library of Congress, Harvard University, Yale University, the University of California, and the University of Illinois. Note that only one of

these is federal, two are private, and two are state institutions. It is now anachronistic for any one of these institutions to hold such a responsibility for its own, even the Library of Congress. It is not anachronistic, however, to entertain a new concept of national responsibility, with a nationwide plan calculated to utilize every major and minor, private or public institution to the extent that it should participate in a national responsibility. Such a plan could be directed by the Library of Congress or even by some supra-national library authority. In the area of acquisitions the entire output of world printing on a single copy basis could be funded by the government quite painlessly in large part by the free use of counterpart funds, and by direct appropriation in the interest of world trade where such funds are not available. The total annual sum needed to carry out such a plan would be less than the cost of one large missile, and unless we can attain national understanding and acceptance of the global bibliographic responsibility, there may not be much purpose in trying to push our rockets to the moon. The first essential change needed in library philosophy affects principally Acquisitions, and this is the complete understanding and acceptance of the national responsibility for acquisition on a global basis of the printed record.

Once this principle is established, the inflowing materials require our attention to the second, which then leads us to our prime subject, Storage libraries. The second principle must be accepted not only by the national government, but also by every library of the country--and this is the principle of nationwide ownership of library materials. This does not mean that any library can demand any other library's books. It does mean that any library may voluntarily turn in such books as it chooses to a National Reserve, with the assurance that a copy will always be available for use in some library of this country. Incoming foreign materials under the National Reserve Plan would first be made available without cost to libraries which might elect to

receive certain subjects and certain countries, pre-cataloged at source and shipped direct. Those not requested would flow to preselected depositories to be established under state-federal plans. The same depository could serve public, academic and national purposes; the resources of each could be held to one copy of each, if necessary, and for the majority of all titles, this might well suffice. Single card reporting, to a National Reserve card center could conceivably relieve forty-eight out of forty-nine states of even their last copy of an unlikely item. Under such a system, as rapid communication and facsimile transmission reach a practical stage, the location of a unique copy in any part of our country would constitute no barrier to use. These ideas may seem visionary, but they do represent one possible approach to the resolution of a number of our toughest problems as well as a realistic view of what our ultimate goals must be. Whether or not it is possible to establish new principles now in our field, these suggestions will help to point up the targets for research which must be sighted in to prove or disprove our present theories.

We talk and write glibly on global acquisitions without any absolute proof that we need everything published anywhere or that everything published merits preservation. One field for critical investigation lies most certainly within this area. This kind of research implies also the determination of what is really needed in a given university library, a college library, or a public library, whatever its public. In brief, it demands scientific evidence of what a library needs in printed resources to do its job.

When we have the answers to what is needed, we will need research in methods of disposal, relocation, and reporting what is rejected. This involves critical examination of cataloging and decataloging methodology, transfer and storing problems, and the knotty difficulties of maintaining bibliographical control of widely scattered resources.

Some research in legal precedents will be required to enable interstate or even intra-state free relocation of library materials, but it seems quite likely that this concept will require new legislation rather than a review of past law. Research will be needed to demonstrate the importance of national responsibility, for this is one area where, with the exception of a few federal libraries, our country has developed very democratically a thoroughly dispersed national responsibility.

The above few indications of directions for research are not to be construed as implying that nothing has been done. However, we must recognize that it is far easier to find subjects needing research in our field, than areas where permanent solutions have been found. (51) In the literature of storage and deposit libraries, despite its very considerable volume, we find only some germs of ideas, fundamentally sound, but insufficiently developed to obtain general acceptance in practice.

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